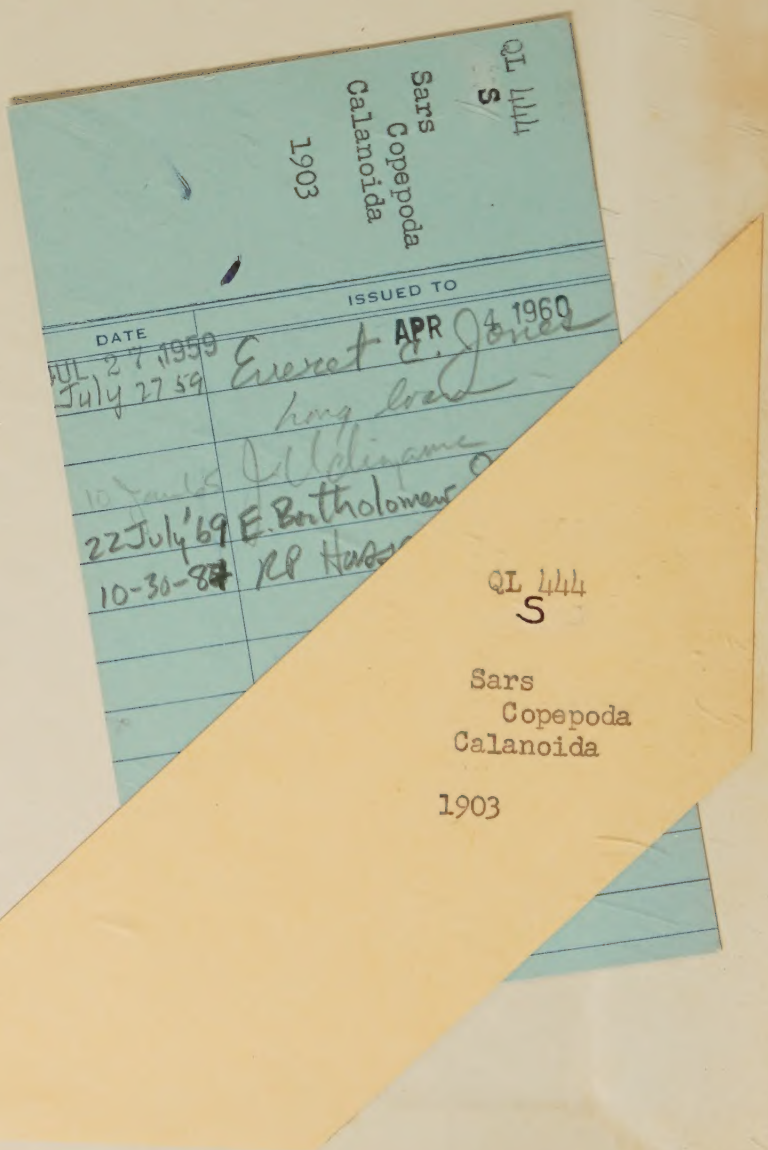
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AN ACCOUNT

OF THE

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OF

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AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS
PROFESSOR OF ZOOLOGY AT THE UNIVERSITY OF CHRISTIANIA

VOL. IV.

COPEPODA

CALANOIDA

WITH 108 AUTOGRAPHIC PLATES

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BERGEN. JOHN GRIEG.

PREFACE.

The present Volume deals with one of the great divisions of the extensive order, *Copepoda,* viz., that of the *Calanoida,* which of late has attracted the special interest of biologists, on account of the enormous numbers in which some of the species are sometimes found to appear, forming, as they do, a very essential part of the so-called *Zoö-plankton.* As not only the amount of the plankton, but also its quality is of great significance in determining the nutritive value of the water both in the sea and in lakes, a thorough knowledge of the organisms composing it may be said to be quite indispensable. It is now generally admitted that Copepoda of the Calanoid group form an essential part of the nourishment of several of our common food-fishes, either in the adult state, or at any rate in the earlier periods of their life; and the investigation of these little creatures must therefore be regarded as intimately connected with that of the fisheries, whether in the sea or in lakes.

The present Volume, which gives full diagnoses and figures of all Norwegian Calanoids, both marine and fresh-water, known at present, may thus, I hope, be of essential use to those who are studying our fisheries and the biological conditions connected therewith.

In order to make the determination of the species as easy as possible, I have given, besides anatomical analyses, carefully drawn habitus-figures of all, in most cases both a dorsal and a lateral view, and as a rule of both sexes. The detail figures, unlike those in Dr. Giesbrecht's work, are always arranged in such a manner, that they can at once be referred to their respective species.

An objection may perhaps be urged against the practical arrangement of the present Volume, as also of the 3 preceding Volumes, viz., that no analytical tables are given. In my opinion, however, the practical value of such tables, especially when they comprise a great number of different forms requiring a more or less complicated arrangement, has been much overestimated. I think that the

student, instead of labouring through such a complicated table, will in most cases prefer the much more simple and direct method of determination by comparing his specimen with the figures, and, if still in doubt, consulting the short diagnoses given of the respective families, genera and species.

In the elaboration of this Volume, I have been assisted by several distinguished naturalists both in my own country and abroad; and I desire here to tender them my best thanks. Among foreign naturalists, my thanks are due to Canon A. M. Norman, Mr. Th. Scott, Prof. Brady and Prof. Cleve, for sending me interesting specimens. I am also greatly indebted to the Zoological Station at Naples for a very interesting series of plankton-samples, which have been of great use to me in comparing the Mediterranean species with those of the northern seas. The Norwegian naturalists to whom I wish to offer my hearty thanks are Mr. O. Nordgaard, director of the Biological Station in Bergen, and Dr. J. Hjort, director of the Norwegian marine fisheries. To the latter gentleman I am especially indebted for the opportunity he gave me of examining the numerous plankton-samples taken during the cruise of the "Michael Sars" in different parts of the Norwegian Sea. A most important addition to the Calanoid fauna of Norway has thereby been gained, as will be shown in the course of the account here given. Finally, I beg to thank the direction of the Bergen Museum for the readiness with which it has undertaken the continued publication of the present extensive work.

G. O. Sars.

ERRATUM.

Page 114, line 10: *for* „It was subsequently recorded," *read* „It had been previously recorded."

PRINCIPAL WORKS ON CALANOIDA.

Baird, W. The Natural History of the British Entomostraca. 1850.

Boeck, A. Oversigt af de ved Norges Kyster iagttagne Copepoder. Chr. Vid. Selsk. Forh. 1864.

— Nye Slægter og Arter af Saltvandscopepoder. Chr. Vid. Selsk. Forh. 1872.

Brady, G. S. A Monograph of the free and semiparasitic Copepoda of the British Islands, Vol. I. 1878.

— Report on the Copepoda collected by H. M. S. Challenger during the years 1873—76. 1883.

— A Revision of the British species of fresh-water Cyclopidæ and Calanidæ. Trans. North. Durh. Newc.-on-Tyne, Vol. XI. 1891.

Canu, E. Les Copépodes marins du Boulonnais. Bullet. Scient. 1888 & 1890.

— Les Copépodes du Boulonnais. 1892.

Claus, C. Die freilebenden Copepoden, mit besonderer Berücksichtigung der Fauna Deutschlands, der Nordsee und des Mittelmeeres. 1863.

Cleve, P. T. The Seasonal Distribution of Atlantic Plankton Organisms. 1901.

Dana, I. D. Crustacea of the United States Exploring Expedition. 1855.

Giesbrecht, W. Die freilebenden Copepoden der Kieler Föhrde. 4te Bericht. Commiss. Wiss. Unters. Deutschen Meeres. 1882.

— Fauna und Flora des Golfes von Neapel. XIX Monographie: Pelagische Copepoden. 1892.

— *& Schmeil.* Copepoda gymnoplea in "Das Thierreich". 1898.

Guerne, J. & Richard, J. Révision des Calanides d'eau douce. 1889.

Herrick, C. L. & Turner, C. H. Synopsis of the Entomostraca of Minnesota. 2nd Report of the State Zoologist. 1895.

Jurine, L. Histoire des Monocles qui se trouvent aux environs de Genève. 1820.

Karawajew, W. Beiträge zur Fauna der Copepoden des Schwarzen Meeres (Text in Russian). 1894.

Kröyer, H. Karcinologiske Bidrag. Naturh. Tidsskrift 1846—1849.

Lilljeborg, W. De Crustaceis ex ordinibus tribus in Scania occurrentibus. 1853.

Lubbock, Sir John. On some Oceanic Entomostraca collected by Capt. Toynbee. Trans. Linn. Soc., Vol. XXIV. 1863.

Milne-Edwards, H. Histoire Naturelle des Crustacés. 1834.

Müller, O. Fr. Entomostraca sive Insecta testacea quæ in aquis Daniæ et Norvegiæ reperit. 1785.

Nordqvist, O. Die Calaniden Finlands. 1888.

Sars, G. O. Oversigt af de indenlandske Ferskvandscopepoder. Chr. Vid. Selsk. Forh. 1863.

— Pelagic Entomostraca of the Caspian Sea. Ann. Mus. Zool. Acad. St. Petersburg. 1897.

— The Cladocera, Copepoda and Ostracoda of the Iana Expedition. Ann. Mus. Zool. Acad. St. Petersburg. 1898.

— The Norw. North Polar Expedition 1893—96. Scientific Results. V. Crustacea. 1900.

Schmeil, O. Deutschlands freilebende Süsswasser Copepoden, Vol. III. Centropagidæ. Bibliotheca Zoologica, Part 21. 1896.

Scott, Th. Report on Entomostraca from the Gulf of Guinea. Trans. Linn. Soc. London. Vol. VI, Part 1. 1894.

— Several papers in the Annual Reports of the Fishery Board for Scotland.

SYSTEMATIC LIST

OF THE SPECIES DESCRIBED IN THE PRESENT VOLUME.

Amphascandria.

Calanidæ.

Calanus, Leach.
finmarchicus, Gunner.
helgolandicus, Claus.
hyperboreus, Kröyer.

Eucalanidæ.

Rhincalanus, Dana.
nasutus, Giesbrecht.

Paracalanidæ.

Paracalanus, Boeck.
parvus, Claus.

Pseudocalanidæ.

Pseudocalanus, Boeck.
elongatus, Boeck.
gracilis, G. O. Sars.
Microcalanus, G. O. Sars.
pusillus, G. O. Sars.
Spinocalanus, Giesbrecht.
abyssalis, Giesbrecht.

Ætideidæ.

Ætideus, Brady.
armatus, Boeck.
Ætideopsis, G. O. Sars.
rostrata, G. O. Sars.
Chiridius, Giesbrecht.
armatus, Boeck.
obtusifrons, G. O. Sars.
Gaïdius, Giesbrecht.
tenuispinus, G. O. Sars.
brevispinus, G. O. Sars.
Undinopsis, G. O. Sars.
Bradyi, G. O. Sars.
similis, G. O. Sars.
Bryaxis, Boeck.
brevicornis, Boeck.

Euchætidæ.

Euchæta, Philippi.
norvegica, Boeck.
glacialis, Hansen.
barbata, Brady.

Phaënnidæ.

Pseudophaënna, G. O. Sars.
typica, G. O. Sars.
Xanthocalanus, Giesbrecht.
borealis, G. O. Sars.
propinquus, G. O. Sars.

Scolecithricidæ.

Amallophora, Scott.
magna, Scott.
brevicornis, G. O. Sars.
Scolecithricella, G. O. Sars.
minor, Brady.

Isokerandria.

Diaixidæ.

Diaixis, G. O. Sars.
hibernica, Scott.

Stephidæ.

Stephos, Scott.
lamellatus, G. O. Sars.
Scotti, G. O. Sars.
Parastephos, G. O. Sars.
pallidus, G. O. Sars.

Tharybidæ.

Tharybis, G. O. Sars.
macrophthalma, G. O. Sars.

Pseudocyclopiidæ.

Pseudocyclopia, Scott.
stephoides, Thompson.

Heterarthrandria.

Centropagidæ.

Centropages, Kröyer.
typicus, Kröyer.
hamatus, Lilljeborg.
Isias, Boeck.
clavipes, Boeck.
Limnocalanus, G. O. Sars.
macrurus, G. O. Sars

Diaptomidæ.

Diaptomus, Westwood.
castor, Jurine.
denticornis, Wierzejsky.
bacillifer, Koelbel.
laticeps, G. O. Sars.
laciniatus, Lilljeborg.
gracilis, G. O. Sars.
graciloides, Lilljeborg.

Temoridæ.

Temora, Baird.
longicornis, Müller.
Eurytemora, Giesbrecht.
velox, Lilljeborg.
hirundoides, Nordqvist.
lacustris, Poppe.
Heterocope, G. O. Sars.
saliens, Lilljeborg.
borealis, Fischer.
appendiculata, G. O. Sars.

Metridiidæ.

Metridia, Boeck.
longa, Lubbock.
lucens, Boeck.
Pleuromamma, Giesbrecht.
robusta, Dahl.

Heterorhabdidæ.

Heterorhabdus, Giesbrecht.
norvegicus, Boeck.
Haloptilus, Giesbrecht.
longicornis, Claus.
acutifrons, Giesbrecht.

Arietellidæ.

Scottula, G. O. Sars.
inæquicornis, G. O. Sars.
Paramisophria, Scott.
Cluthæ, Scott.

Pseudocyclopidæ.

Pseudocyclops, Brady.
obtusatus, Brady.

Candaciidæ.

Candacia, Dana.
norvegica, Boeck.
armata, Boeck.

Pontellidæ.

Anomalocera, Templeton.
Patersoni, Templeton.

Labidocera, Lubbock.
Wollastoni, Lubbock.

Parapontellidæ.

Parapontella, Brady.
brevicornis, Lubbock.

Acartiidæ.

Acartia, Dana.
longiremis, Lilljeborg.
Clausi, Giesbrecht.
discaudata, Giesbrecht.

INTRODUCTION.

Of all the orders of Crustacea, that of the *Copepoda* is perhaps the most extensive one, comprising, as it does, an immense number of forms, which, both as to structure and habits, exhibit quite wonderful variation. Some of them lead a free existence as pelagic organisms, and are comparatively highly organized; some are more sedentary in habits, being restricted to the bottom, or are partly semiparasitic; and a considerable number are true parasites, becoming so much degenerated in the adult state, that they sometimes even hardly admit of being recognized as Crustacea, but look more like worms. It is easy to believe that the parasitic forms have originally descended from free-living forms; and indeed, the semiparasitic Copepoda form a well-marked transition between the 2 groups. In consequence of this, the most primitive characters must be sought for not among the parasites, but among the free-living forms. During the development, which is always at true metamorphosis, all the Copepoda pass through some free-living stages, the earliest of which is the well-known, so-called *Nauplian* stage, also found in some other Crustacea, for instance the *Phyllopoda* and the *Euphausiidæ*. This very primitive stage is characterised by a rounded or oval, unsegmented body, which only carries 3 pairs of movable appendages, viz., the antennulæ, the antennæ, and the mandibular legs, the mouth being protected in front by a large flap-shaped lip. The segmentation of the body takes place gradually in the succeeding stages, but never attains that elaborate arrangement found in the higher Crustacea (the Malacostraca), and is sometimes again wholly lost in the parasitic life. As is clearly shown by the development of the *Euphausiidæ*, and by the structure of the *Phyllocarida*, one of the chief divisions found in the higher Crustacea (Malacostraca), and often constituting by far the greater part of the body, viz., the mesosome, never comes to development in the Copepoda. On the other hand the posterior part of the body is, as a rule, like that in the *Phyllocarida*, divided into 2 sharply defined

sections, the metasome and urosome, the former carrying the natatory legs, evidently answering to the pleopoda in the Malacostraca, whereas the latter never carries any true appendages, and is terminated by the so-called furca or caudal rami. The division anterior to the metasome may more properly be termed the cephalosome, though very often confluent with the 1st segment of the metasome. It carries, as a rule, 6 pairs of movable appendages, viz., the anterior and posterior antennæ, the mandibles, the maxillæ, and 2 pairs of maxillipeds. At about the middle of this division, below, the oral aperture occurs, in the free-living forms bounded in front by a flap-shaped anterior lip and behind by a bilobate posterior lip. These lips in some of the parasitic forms are prolonged into a sipho receiving the styliform masticatory parts of the mandibles. A more or less pronounced reduction of the cephalic appendages may be observed in the most degenerate parasites (Lernæoida); and even in one peculiar group of free-living forms, the *Monstrilloida*, this reduction is so far advanced, that only the anterior antennæ are left, not even the slightest trace of either the posterior antennæ or any of the oral appendages being visible, at any rate in the adult state.

As to the classification of the Copepoda, the views of the several authors differ considerably, according to the characters which have been selected as the basis for the classification. The well-known classification of the Copepoda by T. Thorell into 3 great divisions, *Gnathostoma*, *Poecilostoma* and *Siphonostoma*, refers exclusively to the structure of the oral parts, and was at first much esteemed by carcinologists. As, however, quite gradual transitions in the structure of the oral parts between these 3 types have been found to exist, and moreover, by accepting these groups, otherwise evidently nearly-allied forms would be separated from each other in an unnatural manner, this classification cannot at present be regarded as fully satisfactory. The establishment by Dr. Giesbrecht of the 2 great divisions, or sub-orders, *Gymnoplea* and *Podoplea*, is certainly more natural; but these divisions do not nearly suffice for the comprising of all the Copepoda, as they apparently relate only to the pelagic form examined by that author. Nor, I believe, can the recent subdivision of the Copepoda proposed by Dr. E. Canu, according to the structure of the female genital openings, into the *Monoporodelphia* and *Diporodelphia*, lay any claim to general acceptation. There are, I think, 7 distinct types among the Copepoda, which may indicate as many great divisions or sub-orders. These types are represented by the following well-known genera: *Calanus*, *Harpacticus*, *Cyclops*, *Notodelphys*, *Monstrilla*, *Caligus* and *Lernæa*. In accordance herewith, 7 divisions are adopted in the present work, viz., *Calanoida*, *Harpacticoida*, *Cyclopoida*, *Notodelphyoida*, *Monstrilloida*, *Caligoida* and *Lernæoida*, each comprising a number of distinct families, which may be referred to 2 or

more sections. The first-named division, which forms the subject of the present Volume, answers to the sub-order *Gymoplea* of Dr. Giesbrecht, and comprises the most highly organized Copepoda.

The free-living marine Copepoda of Norway have been partly studied by the late A. Boeck, who, in the Transactions of the Christiania Scientific Society, has given a preliminary account of the species observed by him. I have myself, during a long series of years, given my attention both to the marine and fresh-water forms of our country, and have long since published a synopsis of the latter. Among foreign naturalists who have made these Crustacea the object of special study, may be named the late Prof. C. Claus, to whom we are indebted for a rather full account of the internal anatomy and development of Copepoda, and Prof. G. S. Brady, whose monograph of the British free and semiparasitic Copepoda is especially valuable for the knowledge of the northern forms. More recently a standard-work on these Crustacea has been published by Dr. W. Giesbrecht, forming one of the admirable series of treatises edited by the Zoological Station of Naples. This excellent work, which, however, only relates to the strictly pelagic forms, comprises, besides Mediterranean species, also forms from all parts of the Oceans, and thus gives by far the most complete account of the species of this kind. Both the descriptions and figures are far superior to any formerly given, and it is only to be regretted that the arrangement of the figures on the plates is such, that no little trouble is entailed to find at once the details relating to each species. Though I do not venture to think that the modest account here given will in any way compete with Dr. Giesbrecht's splendid work, I hope that its arrangement may be found somewhat more convenient by students for an easy determination of the northern species.

CALANOIDA.

The chief characters of this great division have been well pointed out by Dr. Giesbrecht, and consist in the firm conjunction of the last pedigerous segment with the preceeding one, with which it is not infrequently even wholly coalesced, whereas in most other Copepoda this segment forms a very movable articulation with the former, and is firmly connected with the 1st segment of the urosome, thus giving it the appearance of belonging more properly to that section of the body. In all the forms the anterior division of the body, comprising the cephalosome and metasome, is much broader than the posterior (urosome), which is abruptly narrowed and very movably connected with the former. The female genital openings occur generally close together on the ventral face of the 1st caudal segment, whereas in the male only a single such opening is found lying asymmetrically, generally on the left side.

As to the several appendages, the anterior antennæ are as a rule much elongated, sometimes of the very same appearance in the two sexes, but more generally transformed in the male, either by a reduction of the number of articulations combined with a much more abundant supply of the peculiar sensory appendages named by Dr. Giesbrecht "aesthetascs", or by a geniculated structure of one, generally the right, antenna. The posterior antennæ are always biramous, with the inner ramus (endopodite) biarticulate, the outer (exopodite) multiarticulate, though the latter, in some cases, is much reduced in size. The mandibles generally have the masticatory part exceedingly dentate, and are provided with a well-developed biramous palp, which, like the posterior antennæ, is subservient to locomotion. The maxillæ generally exhibit a rather complicated structure, though the same chief parts as in the 2 preceding pairs of appendages may easily be demonstrated, with the addition of 3 setiferous lobes, the generally large vibratory plate outside the basal part, and the 2 much smaller appendicular lobes occurring close together inside between the basal part and the palp. The 2 pairs of

maxillipeds always form simple stems furnished with procurved setæ or claws, and on them may be easily distinguished a basal and a terminal part, the former generally biarticulate, the latter multiarticulate. As a rule, the posterior maxillipeds are more slender than the anterior; but in some cases this pair is much reduced in size, whereas the anterior pair may be very powerfully developed. Of legs generally 5 pairs occur, the 4 anterior of which are always natatory and biramous, whereas the last pair are only exceptionally of that character, but in the female are more generally much reduced, not infrequently even wholly absent, and in the male are transformed into prehensile organs, by the aid of which the spermatophores are grasped and transferred to the female. The normal number of caudal setæ is 5 on each ramus; but this number is sometimes reduced to 4 or even to 3. In every case, in addition to the true caudal setæ, a slender bristle may be observed on the inner corner of each ramus, generally extending dorsally, more rarely ventrally. The ovisac, when present, is always simple, more or less flattened in form, and attached to the ventral face of the genital segment.

As to the internal organisation, the Calanoida are prominently distinguished by the presence of a well-developed heart occurring dorsally at the limit between the 1st and 2nd pedigerous segments. The male generative organ is asymmetrical, the efferent duct being located on one side, generally the left. The asymmetrical structure of the last pair of prehensile legs is apparently in accordance with this circumstance.

By far the greater number of the Calanoida are marine; but there are also several forms peculiar to fresh or brackish water, especially of the families *Centropagidæ, Diaptomidæ* and *Temoridæ*. In the Oceans some forms, especially of the genus *Calanus*, often occur in immense shoals, forming the bulk of the "Zooplankton". These animals therefore are of great importance as fish-food, and in some cases even form the chief nourishment of the great whales.

The exact subdivision of the Calonoida is connected with no small difficulty, owing to the great variation in the leading characters. Dr. Giesbrecht, in his beautiful work, has however tried to make such a subdivision. His two primary sections, *Amphascandria* and *Heterarthrandria,* are very natural, though I think that a 3rd such section ought to be added, comprising those forms in which the anterior antennæ are alike in both sexes. For this section I propose to use the name *Isokerandria,* applied by Dr. Giesbrecht also to a section of the *Cyclopoida.* According to Dr. Giesbrecht's classification the 1st section only includes a single family, the *Calanidæ,* whereas the 2nd comprises 3 families, viz., the *Centropagidæ, Candacidæ* and *Pontellidæ.* The 2 first

families are again divided into a great number of sub-families, whereas the 3rd only includes a single such sub-family, and the 4th only 2. The disproportion of this classification is very obvious. In my opinion the number of true families accepted by Dr. Giesbrecht is much too small in proportion to the numerous Calonoid genera established, and I have therefore felt justified in raising the several sub-families to the rank of true families, though some of them, it is true, are rather closely allied. I think that thus a more uniform and convenient arrangement of the genera may be obtained.

As the very great majority of the Calanoida are pronouncedly pelagic animals, often occurring in the open sea at a considerable distance from the coast, the limits of the fauna-domain ought in this case to be considerably more extended than is generally allowed for the bottom-forms. I therefore refer to the Norwegian fauna all forms that have been found anywhere in those parts of the Ocean surrounding the Norwegian coast, viz., the Skagerak, the North Sea, that part of the North Atlantic generally termed the Norwegian Sea, and bounded on the west by the Shetland Isles, Iceland and Jan Mayen, and on the east by Spitsbergen and Bear Island, and finally the Barents Sea, which washes the greater part of the Finmark coast. Indeed, any form that has been observed even at the outer limits of these parts of the Ocean, may be assumed occasionally also to occur in the immediate neighbourhood of the Norwegian coast.

Though the distribution of some Calanoid species has proved to be extraordinarily wide, we must, I think, admit that several of the forms found off the Norwegian coast are of true arctic origin, others peculiar to the North Atlantic, and others again of still more southern rise; for it is very likely that northern forms may occasionally be carried far away from their true home by currents, and, *vice versa*, southern forms may be carried in the same manner northwards, beyond the limits of their true domain. It may thus easily happen that species of very different origin may be found in the very same tract of the Ocean, though perhaps at different seasons of the year. In the great depths of the Norwegian fjords, a peculiar Calanoid fauna was long ago proved to occur. By the recent investigations of the plankton-organisms taken during Nansen's Polar Expedition, it has been ascertained by the present author that the greater number of these peculiar deep-water Calanoids are of true arctic origin, the same species occurring also in the Polar basin, often at the very surface of the sea. They must accordingly be regarded as relict arctic forms, existing in the depths of the fjords from ancient times (the glacial period), when the sea surrounding the Norwegian coast still exhibited a purely arctic character.

Section 1.

Amphascandria.

This section is chiefly characterised by the fact that both of the anterior antennæ in the male are alike and only slightly transformed, never exhibiting any geniculate structure, but only differing from those in the female by a more or less pronounced coalescence of some of the articulations, and in the much more abundant supply of sensory appendages. In the greater number of genera the adult male is moreover distinguished by a very conspicuous transformation of the oral parts, some of which appear greatly reduced. In some cases also the external appearance of the male is so very different from that of the female, that it becomes rather difficult to recognise both as belonging to the same species.

All the Amphascandria, as yet known, are marine, and by far the greater number lead a true pelagic life, though there are a few forms that seem to be more restricted to the bottom, being as yet only found close to the ground in moderate depths, e. g. the species of the genera *Undinopsis, Bryaxis* and *Pseudophaënna.* On the other hand, some of the forms, e. g. *Paracalanus parvus,* are almost constantly found at the very surface of the sea, and are often thrown by the waves upon the shore, where they may be found in considerable numbers, left in tidal pools.

The Norwegian forms belonging to this section may be referred to 8 different families, of which diagnoses are given below.

Fam. 1. Calanidæ.

Characters.—Cephalosome well defined, or coalescent with the 1st pedigerous segment; front carrying below 2 soft posteriorly curving tentacular filaments. Last pedigerous segment not confluent with the preceding one, and having the lateral corners but slightly produced. Urosome not very slender, consisting in female of 4, in male of 5 segments, caudal rami comparatively short, with the normal number of setæ. Eye simple, very small, subventral. Anterior antennæ in female long and slender, consisting of 25 articulations, which are supplied anteriorly with comparatively short and uniform bristles; penultimate and antepenultimate articulations each having behind an unusually strong and densely plumous seta extended straight backwards. Anterior antennæ in male thickened at the base, with some of the proximal articulations fused together and supplied below with a restricted number of comparatively short sensory appendages. Posterior antennæ with the rami of about equal length. Oral parts of normal structure, being but slightly transformed in male. Legs with both rami 3-articulate, terminal joint of outer ramus with only 2 spines outside. 5th pair of legs in female of a similar structure to that in the preceding pairs, in male more or less transformed, left leg the stronger.

Remarks.—This family, answering to the subfamily *Calaninæ* of Dr. Giesbrecht, is chiefly characterised by the structure of the 5th pair of legs, which, at any rate in the female, are natatory and of a similar appearance to that of the preceeding pairs. Moreover, the long and slender anterior antennæ, with the 2 remarkably developed subapical setæ, furnish an easily recognizable character. The family comprises as yet only 2 genera, viz., *Calanus* Leach, and *Undina* Dana. These 2 genera, it is true, have been combined by Dr. Giesbrecht; but I think that they ought more properly to be kept apart, as the structure of the last pair of legs in the male differs conspicuously in the 2 genera. In the northern seas only the first-named genus is represented.

Gen. 1. **Calanus**, Leach, 1816.

Syn: *Cetochilus*, Roussel de Vauzème, Baird, Claus.

Generic Characters.—Body comparatively slender, with the anterior division oblong subcylindric in form, and more than twice as long as the posterior.

Cephalosome generally well defined from the 1st pedigerous segment, and slightly carinated dorsally in the male, frontal part obtuse, and more or less projecting between the insertions of the anterior antennæ. Lateral corners of last pedigerous segment generally rounded off. Urosome symmetrical, with the genital segment in female comparatively short and but slightly protuberant below. Caudal rami well defined from the anal segment, and in male movably articulated to it, admitting of being spread outwards, 2nd caudal seta (from within) longer than the others. Anterior antennæ generally longer than the body, and much more strongly built in male than in female, with the first 2 articulations fused together into a broad, somewhat flattened segment. Posterior antennæ with the outer ramus 7-articulate. Posterior maxillipeds with the terminal part longer than either of the basal joints, and 5-articulate, setæ of the outer edge in male remarkably developed and densely plumous. Legs comparatively slender, inner ramus well developed, though considerably shorter than the outer, its 2nd joint (except in last pair) having 2 natatory setæ inside. Last pair of legs with the 1st basal joint denticulate along the inner edge, but without the plumose seta present in the other pairs; outer ramus in male without any natatory setæ, and more strongly developed on left side, though imperfectly prehensile; inner ramus in both legs well developed, and resembling that in female.

Remarks.—In the restriction here adopted, this genus is chiefly characterised by the imperfect prehensility of the last pair of legs in the male, this pair still preserving its natatory character, whereas in the 2nd genus, *Undina,* it is very much transformed, the left leg being quite enormously developed and pronouncedly prehensile. Otherwise these 2 genera are closely related. The present genus comprises several species, and seems to be represented in all parts of the Oceans. To the Norwegian fauna belong 3 nearly-allied species, one of which, however, has generally been confounded with the type species.

1. Calanus finmarchicus, (Gunnerus).

(Pl. I, II, III.)

Monoculus finmarchicus, Gunnerus, Acta Hafnia, Vol. X, p. 175, figs. 20—23.

Syn: *Cetochilus septentrionalis,* Goodsir.
„ *Calanus spitsbergensis,* Kröyer ♀.
„ — *qvinqueannulatus,* Kröyer ♂.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong oval in form, greatest width equalling $^1/_3$ of the length and occurring about in the middle, frontal part but slightly produced; seen laterally, somewhat dilated anteriorly, with the frontal margin broadly rounded and forming, together

with the dorsal one, a perfectly even curve. Lateral corners of last pedigerous segment slightly produced, but rounded at the tip. Urosome about half the length of the metasome; caudal rami somewhat longer than the anal segment. Anterior antennæ, when reflexed, extending beyond the caudal rami by about the last 3 articulations.

Male.—Cephalosome more sharply defined behind than in female, forming at the end dorsally a small gibbous projection, and distinctly carinated above, frontal part somewhat more prominent; lateral corners of last pedigerous segment less produced. Urosome rather slender, with the 2nd segment much the largest. Subapical plumose setæ of anterior antennæ less developed than in female, and somewhat uneqal in length. Last pair of legs with the outer rami not very different in appearance, the left one, however, somewhat longer than the right, with the terminal joint obpyriform in shape and nearly as long as the preceeding joint, corresponding inner ramus reaching beyond the middle of the 2nd joint of the outer one.

Colour.—Body pellucid, more or less tinged with light red, anterior antennæ often bright red.

Size.—Usual length of adult female about 4 mm., of male 3.60 mm. Maximum length of arctic specimens 5 mm.

Remarks.—This is apparently the form at first recorded by Gunnerus as *Monoculus finmarchicus*. It has, however, been confounded by most authors with the succeeding nearly-allied species, from which, on a closer examination, it may be easily distinguished in both sexes, chiefly by the more evenly rounded frontal part, the longer caudal rami, and the less elongated outer ramus of the left last leg in the male. It also attains a considerably larger size than does the above-mentioned species. The 2 supposed species described by Kröyer as *Calanus spitsbergensis* and *C. quinquecannulatus* are unquestionably both referable to the present species, the former being the female and the latter the male.

Occurrence.—Of all the marine Calanoids of Norway, this form is by far the most common, occurring often in enormous shoals, and thus sometimes giving the sea a conspicuously reddish hue. It is found everywhere in the open sea, more frequently at the very surface, though at times it may also descend to greater depths, or be carried by the waves and currents towards the shores or into the bays and fjords. Off the Norwegian coast, I have met with it from Vadsø to Jæderen (Tananger); but farther east it seems to be superseded by the succeeding species. It moves rather rapidly, with abrupt bounds caused by energetic strokes of the natatory legs. At times, however, it is seen quietly suspended in the water, with the anterior antennæ spread out to each side at right

angles to the body, or proceeding slowly by rapid vibrations of the posterior antennæ and the mandibular palps. The male is still more agile than the female, and the motion effected by the posterior antennæ and mandibular palps is more energetic, in accordance with the somewhat stronger development of these appendages and the pertaining muscles, being changed to a somewhat jerky leap through the water. At some seasons male specimens are by no means rare, though the female sex always preponderates considerably in number. This Calanoid is eagerly devoured by some of our common food-fishes, for instance the herring and the mackerel, and in some cases, as stated by Prof. Rob. Collett, forms almost the exclusive nourishment of one of our great whales, *Balænoptera borealis*.

Distribution.—The present species seems to be especially characteristic of the arctic zone, occurring abundantly in almost all samples of plankton taken in that part of the Ocean, from Greenland in the west to the Behring Islands in the east. In the icy Polar basin crossed by Nansen, it occurred everywhere, and often in great abundance, up to and beyond 85° of latitude. The former statements about the extraordinarily wide distribution of the present species southwards, cannot be regarded as reliable, owing to its having been confounded with the succeeding species.

2. Calanus helgolandicus, (Claus).

(Pl. IV.)

Cetochilus helgolandicus, Claus, Die frei lebenden Copepoden, p. 171, Pl. XXVI, figs. 2—9.

Syn: *Calanus finmarchicus*, Brady, Giesbrecht etc. (not Gunnerus).

Specific Characters.—Female. Anterior division of body, seen dorsally, narrow oblong in form, greatest width not attaining $^1/_3$ of the length, frontal part angularly produced between the insertions of the anterior antennæ; seen laterally, scarcely dilated at all anteriorly, frontal margin abruptly and narrowly curved. Lateral corners of last pedigerous segment but very slightly produced and obtusely rounded. Urosome exceeding half the length of the metasome, caudal rami rather short, scarcely longer than the anal segment. Anterior antennæ, when reflexed, reaching beyond the caudal rami by about the last 2 articulations. *Male* resembling that of the preceding species, but having the frontal part considerably more produced. Last pair of legs more asymmetrical, the outer ramus of left leg being considerably elongated, with the terminal joint scarcely exceeding half the length of the penultimate one, inner ramus extending but little beyond the 1st joint of the outer ramus. Body in both sexes very pellucid, with a slight reddish pigment

especially along the ventral side. Length of adult female but little exceeding 3 mm., of male 2.80 mm.

Remarks.—As above stated, this form has generally been confounded with *C. finmarchicus*, to which species it certainly bears a very close resemblance. It is, however, rather inferior in size, and, on a closer examination, may moreover be easily distinguished by the somewhat more slender form of the body, the more produced and narrowly rounded frontal part, the shorter caudal rami, and the considerably more elongated outer ramus on the left leg of the last pair in the male. The *Cetochilus helgolandicus* of Claus is unquestionably this species, and this is also certainly the case with the form recorded by Brady from the Challenger Expedition, and with that described by Dr. Giesbrecht from the Mediterranean.

Occurrence.—I have met with this species very frequently in the Christiania Fjord, for instance at Drøbak, as also in several other places on the southern coast of Norway. I have no certain evidence of its occurrence farther north, though in all probability it also extends for some distance along the western coast.

Distribution.—Its range is evidently a more southern one than that of *C. finmarchicus*. It has been recorded from Heligoland by Claus, from the British Isles by Brady, the western coast of France by Dr. Canu, the Mediterranean by Dr. Giesbrecht, the Black Sea by W. Karawaien, and it is even said by Brady to occur in the Southern Ocean, off New Zealand, though in this case a confusion with a nearly allied species may perhaps be presumed to have taken place.

3. Calanus hyperboreus, Krøyer.

(Pl. V.)

Calanus hyperboreus, Krøyer, Grønlands Amphipoder, p. 84, Pl. IV, fig. 23.

Syn: *Calanus magnus*, Lubbock.

— *finmarchicus*, var. major, auctorum.

Specific Characters.—Female.—Anterior division of body very large, seen dorsally oblong fusiform, greatest width about equalling $^1/_3$ of the length, and occurring in the middle, frontal part but slightly prominent and, seen laterally, evenly rounded. Lateral corners of last pedigerous segment somewhat produced, forming at the tip an acute angle. Urosome not nearly attaining half the length of the metasome, caudal rami comparatively short, scarcely longer than the anal segment. Anterior antennæ, when reflexed, reaching beyond the caudal rami by about the last 3 articulations. *Male* resembling that of the 2 preceding species, but having the frontal part less prominent, and the lateral corners of last pedigerous segment angularly produced, as in female. Last pair of legs but slightly asymmetrical, outer ramus of left leg scarcely longer than that of the right, though

differing in the fact that the terminal joint is narrower and generally incurved; inner ramus of same leg reaching beyond the middle of this joint. Body in both sexes highly pellucid, with the oral area slightly tinged with red. Length of adult female reaching to 9 mm., of male to $6^1/_2$ mm.

Remarks.—This species was established in the year 1838 by Krøyer, but was very imperfectly characterised, for which reason it was not accepted by subsequent authors as a distinct species, but only as a large variety of *C. finmarchicus*. Dr. Giesbrecht has, however, recently vindicated its claim to be regarded as distinct, having pointed out some distinctive characters of the female. The structure of the hitherto unknown male also confirms the correctness of Dr. Giesbrecht's opinion about the distinctness of this form. It may be easily recognized from the 2 preceding species, not only by its large size (it is indeed one of the largest Calanoids known), but also by the angularly produced lateral corners of the last pedigerous segment, and the comparatively short urosome. The male, too, is fairly well marked by the less prominent frontal part, but especially by the structure of the last pair of legs.

Occurrence.—This form is occasionally found off the Finmark coast and the Lofoten Islands, together with *Calanus finmarchicus*; but farther south it seems to be wholly restricted to the great depths of the fjords, occurring under such circumstances as far south as in the Christiania Fjord. It must evidently be regarded here as a relict form, representing a remnant of the glacial fauna which prevailed around our coasts in ancient times (the glacial period).

Distribution.—About the arctic character of this species no doubt can arise, it being met with throughout the Polar Sea from Greenland to the Behring Strait, and often in great abundance at the very surface of the water. In the Polar basin explored by Nansen it was very common, occurring in the greater number of the plankton-proofs examined.

Fam. 2. Eucalanidæ.

Characters.—Body, as a rule, very slender, with the cephalosome and the 1st pedigerous segment generally coalesced, frontal part more or less produced, with 2 soft tentacular filaments below. Last pedigerous segment imperfectly developed. Urosome comparatively short, consisting in female, as a rule, of only 3 segments, caudal rami partly confluent with the anal segment and somewhat

asymmetrical, caudal setæ present in the normal number. Anterior antennæ long and slender, with the articulations somewhat reduced in number, and having some of the setæ much elongated, those attached behind to the penultimate and antepenultimate articulations, as in *Calanus*, densely plumose. Posterior antennæ with the inner ramus longer than the outer. Oral parts on the whole normal. Legs comparatively short, especially the 1st pair, the rami of which have the number of joints more or less reduced; terminal joint of outer ramus in 2nd to 4th pairs with 3 spines outside. Last pair of legs, when present, very small, simple, not natatory.

Remarks.—The forms belonging to this family are easily recognizable by their slender, pellucid body—the cephalic part of which is generally much produced—, by the very long and slender anterior antennæ, and the comparatively short urosome. They differ, moreover, very essentially from the *Calanidæ* in the structure of the legs, especially the last pair, which are much reduced, and not natatory in either of the sexes. According to Dr. Giesbrecht, this family comprises as yet 3 genera, viz., *Eucalanus* Dana, *Rhincalanus* Dana, and *Mecynocera* Thompson. All the species belonging to these genera are southern in distribution, none of them having hitherto been recorded from northern latitudes. I am, however, now enabled to state the occurrence of at least one species so far north as to admit of being referred to the fauna of Norway.

Gen. 2. **Rhincalanus,** Dana, 1852.

Generic Characters.—Cephalosome produced in front to a nose-like projection carrying the rostral filaments below. Last pedigerous segment very small, with the epimeral parts imperfectly developed. Urosome in female 3-articulate, anal segment confluent with the caudal rami, which are only slightly asymmetrical, and carry 2 of the setæ outside, middle apical seta on left ramus greatly elongated. Anterior antennæ much longer than the body, and consisting (in female) of 23 articulations only, the first 2 and the 7th and 8th being fused together. Posterior antennæ with the inner ramus moderately produced, outer ramus 8-articulate, with the terminal joint very small. Posterior maxillipeds with the terminal part shorter than either of the basal joints. First pair of legs with both rami biarticulate, outer ramus af the 3 succeeding pairs with the spines of the outer edge not defined from the joints. Last pair of legs (in female) 3-articulate.

Remarks.—This genus is chiefly characterised by the nose-like anterior projection of the head, a character which has, indeed, given rise to the generic

name proposed by Dana. From the type genus, *Eucalanus* Dana, it is moreover clearly distinguished by the presence of a 5th pair of legs, which in the female of *Eucalanus* are wholly absent. Three species of this genus are as yet known, one of them being now for the first time stated to occur also in the northern oceans.

4. Rhincalanus nasutus, Giesbrecht.

(Pl. VI & VII).

Rhincalanus nasutus, Giesbrecht, Pelagische Copepoden (Fauna und Flora des Golfes von Neapel XIX), p. 154, Pl. 3, fig. 6; Pl. 9, figs. 6, 14; Pl. 12, figs. 9—12, 14, 16, 17; Pl. 35, figs. 46, 47, 49.

Specific Characters.—Female. Body exceedingly slender and elongated, with the anterior division, seen dorsally, narrow oblong in form, greatest width not even attaining $^1/_4$ of the length, and occurring behind the middle, cephalic part gradually attenuated, though slightly widening at the insertions of the anterior antennæ, and produced beyond the latter to a conical anteriorly-pointing projection; rostral filaments not visible in the dorsal view of the animal. Anterior body-segment (the combined cephalosome and 1st pedigerous segment) nearly twice as long as the remaining part of metasome. 2nd, 3rd and 4th pedigerous segments each with 2 small subdorsal, and 2 lateral denticles on the hind edge. Urosome about equalling in length $^1/_5$ of the anterior division, genital segment with 2 small dorsal denticles in the middle. Caudal rami somewhat instricted in their outer part, left ramus a little longer than right, innermost seta of both rami much shorter than the others. Anterior antennæ exceedingly elongated, when reflexed, reaching beyond the caudal rami by about $^1/_3$ of their length, and inserted at rather a long distance from the posterior antennæ and the oral parts, which are closely crowded together. Last pair of legs very small, each of the 2 outer joints with a ciliated seta inside, terminal joint moreover carrying at the tip a similar seta and, outside it, a slender unciliated spine. Body highly pellucid, and almost without any pigment. Length of adult female 5.40 mm.

Remarks.—This species was first described by Dr. Giesbrecht from the western part of the Mediterranean. It is easily recognized by the shape of the frontal projection, and the exceedingly long and slender anterior antennæ. It is moreover distinguished from the type species, *R. cornutus* Dana, by a somewhat different structure of the last pair of legs.

Occurrence.—Two well-preserved female specimens of this peculiar Calanoid were found in a sample of plankton taken during the cruise of the "Michael Sars" at Stat. 10, located at some distance east of Iceland, the depth being stated to be between 250 and 400 meters. Another female specimen was found at an

earlier date in a sample taken by Dr. Hjort in the North Sea, about midway between Scotland and Norway. Though not yet found in the immediate vicinity of the Norwegian coast, this form certainly has a claim to be included in the fauna of Norway.

Distribution.—Western part of the Mediterranean, off Gibraltar, the Pacific from the Magellan strait northwards to Lat. 6° N. (Giesbrecht); Atlantic Ocean from Lat. 6° N. til 48° N (Cleve); ? N. of Scotland (Moebius).

Fam. 3. Paracalanidæ.

Characters.—Body less slender, with the cephalosome not produced in front, and, as a rule, coalesced with the 1st segment of metasome, rostral filaments as in *Calanus*. The last 2 segments of metasome fused together. Urosome short, in female generally 4-articulate; caudal rami well defined, with only 4 of the apical setæ distinctly developed. Anterior antennæ in female 25-articulate, subapical setæ not plumose, those in male greatly thickened at the base, with the proximal articulations much reduced in number, and clothed with comparatively short, club-shaped sensory appendages. Posterior antennæ with the outer ramus scarcely longer than the inner, and having the terminal joint comparatively short. Oral parts in female normal, in male much reduced. Legs rather slender, inner ramus in 1st pair biarticulate, in the 3 succeeding pairs 3-articulate, and partly spinulose on the hind face, outer ramus in the latter with the terminal joint narrow and armed with only 2 spines outside. Last pair of legs, when present, poorly developed, not natatory, left leg in male longer than right, which is sometimes wholly wanting.

Remarks.—In the structure of the several appendages, the forms belonging to this family agree on the whole with those of the *Calanidæ*, differing, however, rather materially in the circumstance of the 5th pair of legs not being natatory in either of the sexes, but very small and simple, or wholly wanting in the female. The adult male has the anterior antennæ transformed in a similar manner to that in the *Calanidæ*, but is distinguished by the great reduction of the oral parts, especially the maxillipeds. The family comprises as yet 3 genera, viz., *Paracalanus* Boeck, *Acrocalanus* Giesbrecht, and *Calocalanus* Giesbrecht. Only the first of these genera is represented in the northern oceans.

Gen. 3. **Paracalanus,** Boeck, 1864.

Generic Characters.—Body comparatively short and stout. Cephalosome wholly coalesced with the 1st pedigerous segment, and slightly carinated dorsally in the male; frontal part rounded. Lateral corners af last pedigerous segment not produced. Urosome in female distinctly 4-articulate, with the genital segment comparatively short. Caudal rami short, obtusely truncated at the tip, apical setæ but slightly divergent. Anterior antennæ scarcely longer than the body, their proximal part exhibiting in male 2 large segments clothed below with short sensory appendages. 1st pair of legs with a well-marked deflexed seta at the end of the basal part inside. Terminal joint of outer ramus in the 3 succeeding pairs finely denticulate along the outer edge. Last pair of legs in female very small, bi-articulate; left leg in male 5-articulate, right leg as in the female.

Remarks.—This genus was established in the year 1864 by Boeck, to comprise a small Calanoid formerly described by Claus as *Calanus parvus.* It may, however, be remarked, that the genus *Calanus*, as defined by Claus, does not answer to Leach's genus, and in reality comprises several genera not even belonging to the family *Calanidæ* in the restriction here adopted. Besides the type species described below, another nearly-allied species has been recorded by Dr. Giesbrecht as *P. aculeatus*, and the imperfectly characterised *Calanus pygmæus* of Claus probably also belongs to the same genus.

5. Paracalanus parvus, (Claus).

(Pl. VIII & IX).

Calanus parvus, Claus, Die frei lebenden Copepoden, p. 173, Pl. XXVI, figs. 10—14, Pl. XXVII, figs. 1—4.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong oval, somewhat more tapering behind than in front, greatest width about equalling $^1/_3$ of the length. Anterior body-segment (combined cephalosome and 1st pedigerous segment) about twice the length of the remaining part of metasome, front evenly rounded. Lateral corners of last pedigerous segment rounded off. Urosome about equalling $^1/_3$ of the length of the anterior division, genital and anal segments of about equal length and much larger than either of the 2 middle segments. Caudal rami scarcely exceeding the anal segments in length, sublinear in form, apical setæ of moderate length, the innermost but one the longest. Anterior antennæ, when reflexed, scarcely reaching beyond the pennultimate caudal segment, some of the articulations less distinctly defined. Posterior antennæ with the outer

ramus a little shorter than the inner, and 7-articulate. 2nd joint of inner ramus in the 2nd and 3rd pairs of legs with an obliquely transverse row of spinules on the hind face. Last pair of legs with the distal joint narrow linear, carrying on the tip a slender spine, outside which a much smaller spinule is secured.

Male differing considerably in its external appearance from the female. Cephalosome somewhat incrassated and exhibiting along the dorsal face an obtuse keel, front considerably more prominent than in female. Urosome rather slender, 5-articulate, with the 2nd segment the largest; caudal rami, as in the male of *Calanus*, mobile. Anterior antennæ rather strongly built, the 2 basal segments defined by a conspicuous constriction, the distal one the longer and consisting of 5 united articulations. Posterior antennæ with the outer ramus consisting of only 6 joints, the last very small, and having only a single seta. Anterior maxillipeds quite rudimentary, knob-like. Posterior maxillipeds likewise much reduced, terminal part indistinctly articulated and carrying behind 3 strong plumose setæ, in front only slight rudiments of bristles. Left leg of last pair with the terminal joint a little shorter than either of the 2 preceding joints, somewhat lamellar, and carrying on the tip 2 small unequal spinules.

Colour. Body of femal pellucid with a bluish tinge, and often exhibiting a broad transverse band of a dark red hue across the middle of the anterior division. Body of male generally of a more uniform yellowish hue.

Length of adult female scarcely exceeding 1 mm., of male about the same.

Remarks.—Dr. Giesbrecht is inclined to believe that the form observed by Boeck might be different from Claus's species. This is certainly not the case, as may be proved by comparing the figures here given with those of Claus and Giesbrecht. It is one of the smallest known Calanoids, and thus fairly deserves its specific name.

Occurrence.—I have found this form rather plentiful in the Christiania Fjord, as also off the southern coast of Norway. It does not seem to occur farther north, however; for Mr. Nordgaard, who has subjected the marine Copepoda of the neighbourhood of Bergen to a careful examination, has not seen any specimen of this form, nor have I myself ever found it in the numerous samples of plankton from the northern ocean that I have examined. It is generally met with at the very surface of the water, both in the open sea and close to the shores, not infrequently even in pools left by the tide.

Distribution.—The range of this Calanoid is pronouncedly southern and quite extraordinarily wide, it having been recorded from the western part of the Baltic, the North Sea, the British Channel, the western coast of France, the Mediterranean, the Atlantic Ocean and the Pacific from Lat. 61° N. to 52° S.

Fam. 4. Pseudocalanidæ.

Syn: *Clausocalaninæ*, Giesbrecht (part).

Characters.—Cephalosome, at any rate in female, coalesced with the 1st segment of metasome, front unarmed, or provided below with 2 soft tentacular filaments, as in *Calanus*. Last segment of metasome united with the preceding one, lateral corners not produced. Urosome in female 4-articulate, in male 5-articulate and having the anal segment shortened. Caudal rami well defined, with only 4 of the marginal setæ developed. Anterior antennæ in female 24-articulate, 8th and 9th articulations being coalesced, in male thickened at the base and clothed with slender, sabre-like sensory appendages, number of articulations reduced. Posterior antennæ with the outer ramus always longer than the inner. Oral parts in female normal, in male much reduced. Legs slender, inner ramus of 1st pair uniarticulate, of 2nd pair biarticulate, of 3rd and 4th pairs 3-articulate; terminal joint of outer ramus in 2nd to 4th pairs narrow, with 3 spines outside, apical spine coarsely serrate. Last pair of legs in female small, simple and 3-articulate, or wholly wanting; those in male likewise simple, but rather slender, left leg 5-articulate, right more or less styliform.

Remarks.—This family answers to the subfamily *Clausocalaninæ* of Dr. Giesbrecht. As, however, the genus *Pseudocalanus* is of much earlier date than *Clausocalanus*, the family ought to be named as above. From the *Paracalanidæ* this family chiefly differs in the structure of the legs, partly also in that of the posterior antennæ. Dr. Giesbrecht refers to this family the following 6 genera: *Clausocalanus* Giesbr., *Ctenocalanus* Giesbr., *Pseudocalanus* Boeck, *Drepanopus* Brady, *Spinocalanus* Giesbr. and *Moebianus* Giesbr. The last-named genus (= *Stephos* Scott) ought, however, in my opinion to be discarded and transferred to a separate family in the section *Isokerandria*, to be treated of farther on. Of the remaining 5 genera, 2 are represented in the fauna of Norway.

Gen. 4. Pseudocalanus, Boeck, 1872.

Syn: *Clausia*, Boeck (not Claparède).
Lucullus, Giesbrecht.

Generic Characters.—Body of comparatively slender form, with the cephalosome and 1st segment of metasome coalesced in both sexes, front rounded and carrying 2 soft tentacular filaments below. Urosome in both sexes very slender,

with the caudal rami sublinear in form. Anterior antennæ shorter than the body, in the male with the 2 proximal articulations coalesced to a large flattened segment, the succeeding 5 articulations well defined. Posterior antennæ with the outer ramus 7-articulate, terminal joint rather large. Inner ramus of 2nd to 4th pairs of legs without any spinules on the hind face. Last pair of legs wholly wanting in female, those in male very slender, right leg styliform and shorter than the left.

Remarks.—This genus, established by Boeck, was first named *Clausia* in honour of the late Prof. C. Claus. As however this name had been previously appropriated by Claparède to designate a genus of parasitic Cyclopoida, it was subsequently by the same author changed to *Pseudocalanus*. Dr. Giesbrecht, on describing the Copepoda from the bay of Kiel, did not at first recognize Boeck's genus, to which the name *Lucullus* was applied; but in a postscript to his treatise he has admitted the identity of these 2 genera. Besides the well-known form described below, 2 other species have been added by the present author from Nansen's Polar Expedition, viz., *P. major* and *P. pygmæus*. The latter, however, I am now inclined to regard as belonging to a new nearly-allied genus, for which the name *Microcalanus* may be proposed.

6. Pseudocalanus elongatus, Boeck.

(Pl. X & XI).

Clausia elongata, Boeck, Oversigt over de ved Norges Kyster iagttagne Copepoder. Chr. Vid. Selsk. Forh. 1864, p. 234.

Syn: *Lucullus acuspes*, Giesbrecht.
„ *Calanus Clausii*, Brady.

Specific Characters.—Female.—Anterior division of body, seen dorsally, oblong oval in shape, greatest width but slightly exceeding $^1/_3$ of the length, frontal part but little prominent, and, seen laterally, narrowly rounded; lateral corners of last segment of metasome obtusely rounded. Urosome somewhat exceeding half the length of the anterior division, genital segment considerably larger than any of the others and slightly dilated in front. Caudal rami exceeding in length the anal segment, and transversely truncated at the tip, exhibiting a small dentiform projection outside the apical setæ. Ovisac present, of irregular rounded form, but easily detached, and containing a very limited number of ova. Anterior antennæ, when reflexed, scarcely reaching beyond the 2nd caudal segment, the 2 basal articulations imperfectly separated. Posterior antennæ with the outer ramus about $^1/_4$ longer than the inner. 1st pair of legs much smaller than the others, terminal joint with only a single setiform spine outside.

Male rather unlike the female, and of considerably smaller size. Cephalosome slightly dilated in front, but scarcely carinated dorsally. Urosome very narrow, with the anal segment shorter than in female, and somewhat dilated distally; caudal rami very mobile, finely ciliated inside, and having the terminal edge somewhat produced in the middle. Anterior antennæ with the number of articulations considerably reduced, a fusion having taken place, not only of the 2 proximal ones, but also of the 8th to 12th and of the 20th and 21st articulations. Last pair of legs rather asymmetrical, left leg much the longer, with the 2nd and 3rd joints slightly dilated distally, terminal joint very small and tipped with a slender spinule; right leg not nearly reaching to the end of the penultimate joint of left, and terminating in a straight, subulate point.

Colour.—Body in both sexes very pellucid, though generally with a faint reddish yellow tinge; oral area, as a rule, tinged with crimson, and the genital protuberance of the female with light green.

Length of adult female 1.40 mm., of male 1.10 mm.

Remarks.—This form was first recorded by Boeck from the Norwegian coast under the name of *Clausia elongata,* and was subsequently rediscovered in the bay of Kiel, by Dr. Giesbrect, who described it as *Lucullus acuspes.* It is easily recognized from the other Norwegian *Amphascandria* by its slender and elongated tail, a character which has, indeed, given rise to the specific name proposed by Boeck.

Occurrence.—I have met with this form very frequently along the whole Norwegian coast from the Christiania Fjord to Vadsø, both in the open sea and close to the shores, where it is occasionally left in tidal pools. It often occurs at the very surface of the water; but it sometimes also seems to descend to greater depths, though on the whole it may be regarded as a true pelagic form. Specimens are not infrequently found carrying a small number of ova enclosed in a thin-skinned, rounded ovisac, which, as usual, is appended to the ventral side of the genital segment; but this ovisac is so very fragile, that at the slightest touch it may become detached. Male specimens are much more scarce than females and, when alive, may be easily recognizable even to the naked eye by their somewhat different jerky movements.

Distribution.—Unlike *Paracalanus parvus,* this Calanoid has a pronouncedly northern range, the most southern place where it has been observed being the northern coast of France (Canu). On the other hand, it is distributed throughout the whole northern Ocean from Baffin's Bay in the west to the New Siberian Isles in the east. It also inhabits the Baltic together with other forms of evidently arctic origin.

Gen. 5. **Spinocalanus,** Giesbrecht, 1892.

Generic Characters.—Body comparatively short, with the urosome not nearly so elongated as in *Pseudocalanus*. Front quite unarmed, without any tentacular filaments below. Anterior antennæ longer than the body, and very flexible; those in male transformed in a manner similar to that in *Pseudocalanus*. Posterior antennæ with both rami rather produced, the outer one being the longer. Posterior maxillipeds unusually slender, with the terminal part much elongated and armed distally with coarsely ciliated procurved setæ. Legs very slender, inner ramus of 2nd to 4th pairs densely spinulose on the hind face. Last pair of legs wanting in female, in male of comparatively small size, right leg not styliform.

Remarks.—This genus was established in the year 1892 by Dr. Giesbrecht, to include a small Calanoid procured from very great depths in the tropical part of the Pacific. The genus differs from *Pseudocalanus* chiefly in the total absence of the usual tentacular filaments at the front, the less slender urosome, the very long anterior antennæ, the peculiar shape of the posterior maxillipeds, and finally in the spiny armature of the inner ramus of the 2nd to 4th pairs of legs. In the northern ocean this genus is represented by a species closely allied to the typical one, and first described by the present author from Nansen's Polar Expedition. This species has proved also to belong to the fauna of Norway.

7. Spinocalanus longicornis, G. O. Sars.

(Pl. XII).

Spinocalanus longicornis, G. O. Sars, The Norwegian North Polar Expedition. V. Crustacea, p. 75, Pl. XXII.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong oval, greatest width somewhat exceeding $^1/_3$ of the length, front obtusely rounded; seen laterally, evenly vaulted above, with the front narrowly produced and without any trace of a rostrum or tentacular filaments below. Lateral corners of last segment of metasome obtusely rounded off. Urosome scarcely exceeding in length $^1/_4$ of the anterior division, genital segment comparatively short and greatly protuberant below; caudal rami very short, being scarcely longer than they are broad, apical setæ about as in *Pseudocalanus*. Anterior antennæ exceeding the body by about $^1/_5$ of their length, penultimate joint provided in front with an unusually long and slender bristle. Posterior maxillipeds with the 2nd joint of the terminal part fully as long as the 3 succeeding joints combined.

Outer ramus of 2nd to 4th pairs of legs provided with scarcely any spinules on the hind face, apical spine exceedingly slender, exceeding the length of the terminal joint. Length of adult female 1.60 mm.

Remarks.—As stated above, this species was first described by the present author from Nansen's Polar Expedition. It is closely allied to the type species, *S. abyssalis* Giesbrecht, but is apparently distinct, the spiny armature of the legs and maxillipeds being, to judge from the figures given by Dr. Giesbrecht, much coarser in the latter species.

Occurrence.—I have not myself ever observed this form off the coast of Norway; but Mr. O. Nordgaard has recently found it in the Osterfjord near Bergen at the considerable depth of from 400 to 600 meters, together with other relict arctic forms. The figures here given are from a well-preserved female specimen kindly sent to me by that naturalist.

Distribution.—The Polar Sea in about the 80th degree of latitude, at 2 different Stations.

Fam. 5. Ætideidæ.

Characters.—Body, as a rule, not very slender, the anterior division being more or less tumefied. Cephalosome coalesced with the 1st segment of metasome, front generally projecting below into a highly chitinised bifid or simple mucronate rostrum, more rarely quite unarmed. Last segment of metasome united with the preceding one, and generally having the lateral corners produced behind. Urosome in female 4-articulate, in male, as usual, 5-articulate and very narrow, with the anal segment much shortened. Caudal rami generally short, with only 4 of the marginal setæ distinctly developed, in male mobile as in the preceding families. Eye generally well developed, though in some cases wholly absent. Anterior antennæ in female of moderate length, or comparatively short, with the 8th and 9th articulations confluent; those in male transformed in a manner similar to those in the *Pseudocalanidæ*, though having the sensory appendages more densely crowded together on the proximal part, and very long and band-like. Posterior antennæ with the outer ramus generally longer than the inner. Oral parts in female on the whole normal; posterior maxillipeds, however, with the terminal part reflexed. Oral parts in male considerably reduced. Legs of a structure similar to that in the *Pseudocalanidæ*, though considerably more strongly built. Last pair of legs always wanting in female, in male generally rather simple in structure.

Remarks.—This family, answering to the subfamily *Ætidiina* of Giesbrecht, forms, as it were a transition between the *Pseudocalanidæ* and *Euchætidæ*. One of the forms, indeed, now comprised within the present family was referred by Boeck to the genus *Pseudocalanus* and another form to the genus *Euchæta*. I think, however, that Dr. Giesbrecht is right in keeping these forms apart from both the above-named families. This family comprises as yet no less than 9 different genera, 4 of which are represented in the fauna of Norway.

Gen. 6. Ætideus[1]), Brady, 1883.

Syn: *Pseudocalanus* Boeck (part).

Generic Characters.—Cephalosome in female highly vaulted anteriorly, almost carinated dorsally, and projecting below into a strong bifurcate rostrum, in male far less vaulted, and without any trace of a rostrum. Last segment of metasome produced behind on each side to a strong mucroniform process more developed in female than in male. Urosome in female comparatively short, genital segment very protuberant below, caudal rami less shortened than in the other forms, with the appendicular bristle of the inner corner unusually long and slender, outermost (5th) apical seta only present as a rudiment. Urosome of male very slender, with the anal segment considerably shortened, almost inconspicuous. Eye subventral, of a somewhat irregular form and obliquely disposed, with a distinct lenticular body below. Anterior antennæ in female comparatively slender, with some of the bristles of the anterior edge rather elongated, last joint very small and imperfectly defined from the penultimate one; those in male shorter, with the 7 proximal articulations well defined, whereas a fusion has taken place of some of the others. Posterior antennæ with the outer ramus but little longer than the inner, and 7-articulate. Posterior maxillipeds not much elongated, 2nd basal joint fusiform, terminal part comparatively short, reflexed. Inner ramus of 2nd pair of legs imperfectly biarticulate. Left leg of last pair in male very slender, 5-articulate, right leg wholly wanting.

Remarks.—This genus was established in the year 1883 by Brady, to include a Calanoid procured during the Challenger Expedition in the Indian Ocean, and regarded as new to science. The genus, though insufficiently charac-

[1]) This name is spelt by Brady *Ætidius;* but, as recently observed by Dr. Giesbrecht, this is unquestionably incorrect, as it is derived from the Greek word ἀετιδεύς, an eaglet.

terised, was accepted by Dr. Giesbrecht, who describes a form from the Mediterranean, which he regards as identical with Brady's species, though in some respects it seems to differ rather conspicuously. Neither of these authors was aware that a very similar form was recorded many years ago from the Norwegian coast by Boeck, who applied to it the very same specific name as that proposed by Brady. The validity of these 3 forms as distinct species is perhaps still somewhat questionable, the similarity of the Norwegian form with that described by Brady being in particular so very close, that I should have been much inclined to regard the two as identical, if the widely remote occurrence of these 2 forms did not seem to forbid such an identification. The genus is easily recognized, at any rate in the female sex, by the very strong and highly chitinized bifurcate rostrum, the boldly vaulted cephalosome, and the coarse mucroniform projections of the last segment of the metasome.

8. Ætideus armatus, Boeck.

(Pl. XIII & XIV.)

Pseudocalanus armatus, Boeck. Nye Slægter og Arter af Saltvands Copepoder. Christiania Vid. Selsk. Forhandl. 1872, pag. 6.

Specific Characters.—Female. Anterior division of body, seen dorsally, oval fusiform, greatest width considerably exceeding $^1/_3$ of the length and occurring in the middle, anterior extremity more narrowed than the posterior, and projecting somewhat between the insertions of the anterior antennæ; seen laterally, strongly vaulted in front, with the dorsal margin of cephalosome forming a bold and continuous curve up to the tip of the rostrum, the latter scarcely incrassated at the base, rami sharply pointed and separated by an even emargination. Lateral corners of last segment of metasome gradually exserted to strong mucroniform processes pointing straight behind, and reaching about to the end of the genital segment. Urosome scarcely exceeding in length $^1/_3$ of the anterior division, genital segment comparatively short and rather dilated in the middle. Caudal rami considerably longer than the anal segment, sublinear, finely ciliated inside, innermost but one of the apical setæ much longer than the others. Anterior antennæ, when reflexed, reaching to about the base of the caudal rami.

Male considerably smaller than female, and of much more slender form of body, front narrowly rounded and quite unarmed; posterior projections of last pedigerous segment far less developed than in female. Urosome exceedingly narrow, and exceeding in length $^1/_3$ of the anterior division; caudal rami generally spread to each side. Anterior antennæ, when reflexed, scarcely reaching to the

end of the 2nd caudal segment. Left leg of last pair nearly as long as the urosome, 3rd joint the longest, terminal one rather small and finely ciliated.

Colour.—Body in both sexes very pellucid, in female being banded transversally with light red. Length of adult female 1.80 mm., of male 1.45 mm.

Remarks.—No doubt can arise as to this being the true *Pseudocalanus armatus* of Boeck. If the form recorded by Brady should prove to be a different species, it must consequently have another specific name. In any case these 2 forms are very closely related, whereas the Mediterranean form described by Dr. Giesbrecht seems to differ from the Norwegian form in several respects. At the base of the rostrum, for instance, there is a conspicuous thickening not found in the latter form, and the posterior projections of the last segment of the metasome are much coorcer, reaching, according to the figures given, beyond the 2nd caudal segment. The colouring of the animal is also rather different, to judge from the coloured figure given on Pl. 2.

Occurrence.—Boeck found this form at Haugesund, west coast of Norway, at a depth of 30 fathoms. I have myself observed it, though in rather small numbers, at about the same depth in 2 different localities, viz., in the upper part of the Christiania Fjord (Bundefjord), and in the Brevik Fjord near Langesund. Moreover some few specimens were found in a sample of plankton taken during the cruise of the "Michael Sars" in the Storfjord (Nordmøre), and in another sample from Stat. 11 (north of Iceland). A solitary specimen was finally found in a sample taken off the Finmark coast NW. of Nordkyn. Mr. Nordgaard has observed this form in the neighbourhood of Bergen.

Distribution.—If the form recorded by Brady should in reality prove to be identical with Boeck's species, the distribution of this Calanoid would be quite perplexing; but I still regard the identification of these 2 forms as somewhat questionable, and I should indeed be more inclined to believe that the present form is exclusively a North Atlantic species. It is, however, certainly not of arctic origin, since it did not occur in any of the numerous samples of plankton taken during Nansen's Polar Expedition, and has never been found anywhere in the Arctic Ocean.

Gen. 7. **Chiridius**, Giesbrecht, 1892.

Syn: *Euchæta*, Boeck (part.)

Generic Characters.—Cephalosome but slightly vaulted in front, rostral projection very small, bifid, or wholly absent. Last segment of metasome produced behind on each side to a more or less developed spiniform process. Urosome about as in *Ætideus* but with the genital segment in female less protuberant below. Caudal rami very short, with the appendicular bristle not prolonged, and proceeding from the lower face of the rami. Eye comparatively large, and placed less ventrally than in *Ætideus*. Anterior antennæ much shorter than the body, but rather slender, and resembling in structure those in the above-named genus. Posterior antennæ with the outer ramus much longer than the inner. Mandibles in female with the masticatory part very largely developed, inner ramus of the palp, however, unusually small. Masticatory parts of mandibles and maxillæ in male quite rudimentary. Anterior maxillipeds in female normal, in male much reduced. Posterior maxillipeds with the 2nd basal joint long and slender, terminal part comparatively short and reflexed. Natatory legs of a structure similar to that in *Ætideus*. Both legs of last pair in male well developed, 5-articulate, the right one being the stronger, 2nd joint in each leg sometimes with a small appendage inside (rudiment of an inner ramus).

Remarks.—This genus was established by Dr. Giesbrecht in the year 1892, to include a Mediterranean species, *C. Poppei*, which, however, is rather imperfectly figured. In the year 1900, I was able to state that this genus is well represented also in the northern ocean, 3 different species having been described from Nansen's Polar Expedition, one of them being at that time considered to be identical with Boeck's *Euchæta armata*. The genus is closely allied to *Ætideus*, from which it differs, however, in the far less developed rostrum, the different shape of the cephalosome, and partly also in the structure of the posterior antennæ, mandibles and posterior maxillipeds. Finally, both legs of the last pair in the male are well developed. 3 species, to be described below, belong to the Norwegian fauna.

9. Chiridius armatus, (Boeck).

(Pl. XV & XVI.)

Euchæta armata, Boeck, Nye Slægter og Arter af Saltvands-Copepoder. Christ. Vid. Selsk. Forhandl. p. 39.

Specific Characters.—Female.—Anterior division of body somewhat tumid, seen dorsally, oblong oval in form, anterior extremity slightly contracted, but

scarcely projecting at all between the insertions of the anterior antennæ, posterior subtruncate, with the lateral corners drawn out to comparatively short and somewhat divergent acute projections; seen laterally only slightly vaulted anteriorly, front narrowly rounded and armed below with a very small bifid rostrum. Urosome considerably exceeding $^1/_3$ of the length of the anterior division, genital segment but slightly dilated. Caudal rami scarcely longer than the anal segment and somewhat divergent, apical setæ of moderate length and densely plumous. Eye unusually large and distinctly bilobate, dark red in colour. Anterior antennæ, when reflexed, reaching to about the middle of the 2nd caudal segment. Posterior antennæ with the outer ramus about $^1/_3$ longer than the inner. 1st pair of legs with a well-marked setiform spine outside the 1st joint of the outer ramus; 2nd pair with the inner ramus distinctly biarticulate.

Male nearly as large as female, but of more slender form; rostral projection and lateral processes of last segment of metasome about as in female. Urosome, as usual, 5-articulate, with the anal segment shortened, and the caudal rami mobile. Anterior antennæ considerably shorter than in female, not nearly so long as the anterior divisions, and somewhat incrassated at the base, consisting of 23 articulations, the proximal ones with long band-like sensory appendages. Mandibular palps much more strongly built than in female, with the inner ramus well developed and carrying at the tip very coarse diverging setæ. Last pair of legs well developed, the right leg being considerably stronger than the left, both with a small unicarticulate appendage inside the 2nd joint, representing a rudiment of the inner ramus, 3rd joint of right leg somewhat curved, and much larger than the others, 4th joint slightly dilated distally, 5th transformed to a slender claw, obtuse at the tip.

Colour.—Body in both sexes pellucid with a faint rosy tinge, intestine in female translucent with a bright red colour, ovarial tubes opaque whitish.

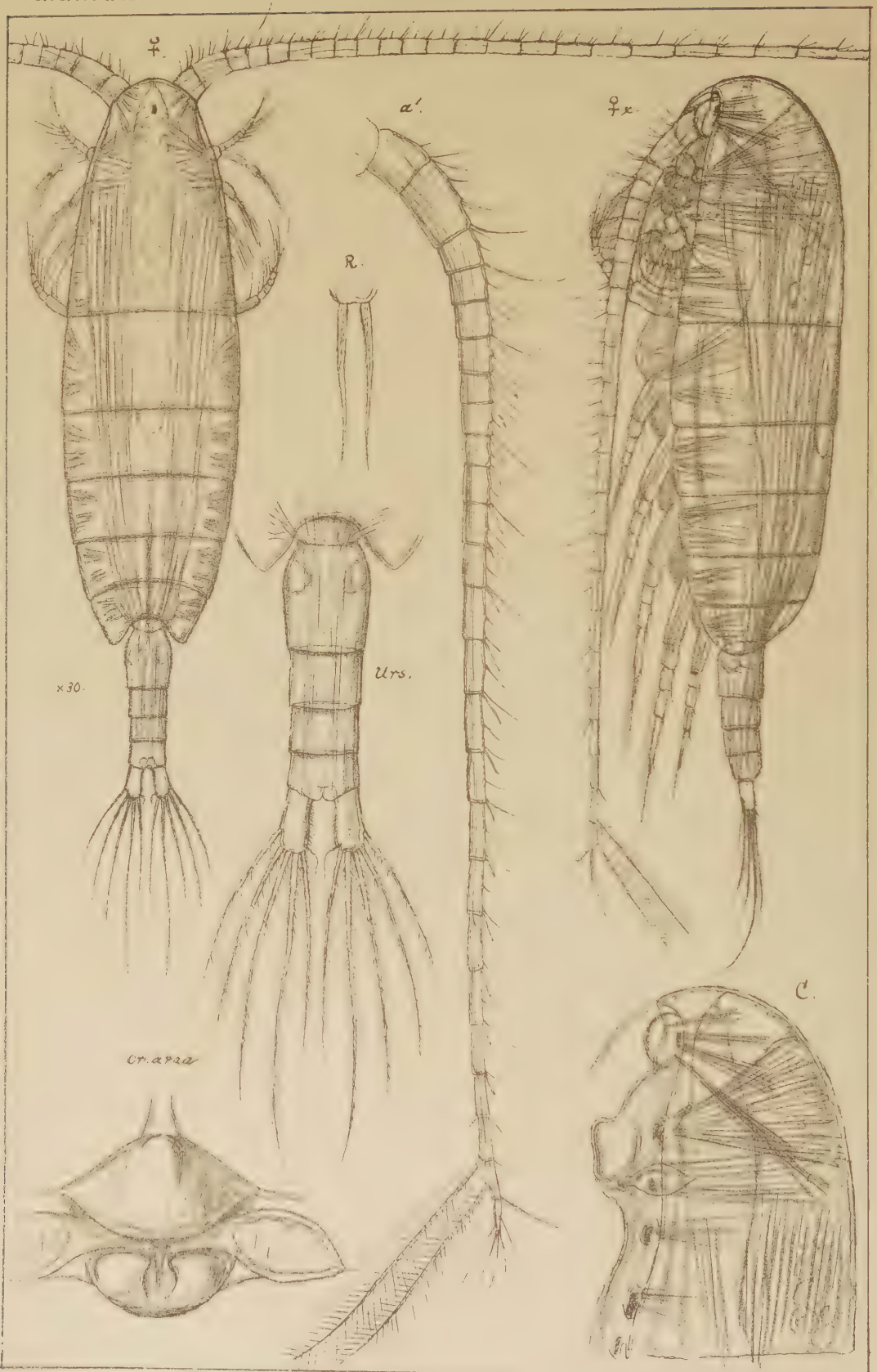
Length of adult female 4 mm., of male about the same.

Remarks.—This form was recorded in the year 1872 by Boeck as *Euchæta armata;* but the characterisation of the species was very insufficient, for which cause it has not been recognized by subsequent authors, even as regards its generic relation. By comparing the drawings left by that author, however, I have convinced myself that the form here under consideration is the true *Euchæta armata* of Boeck. On the other hand, the form from Nansen's Polar Expedition, previously described by the present author under this name, has turned out to be a different, though closely allied, species, as subsequently shown.

Occurrence.—Boeck found this form at Skudesnæs, west coast of Norway, at a depth of 300 fathoms. I have myself met with this Calanoid in great

Copepoda

Calanoida

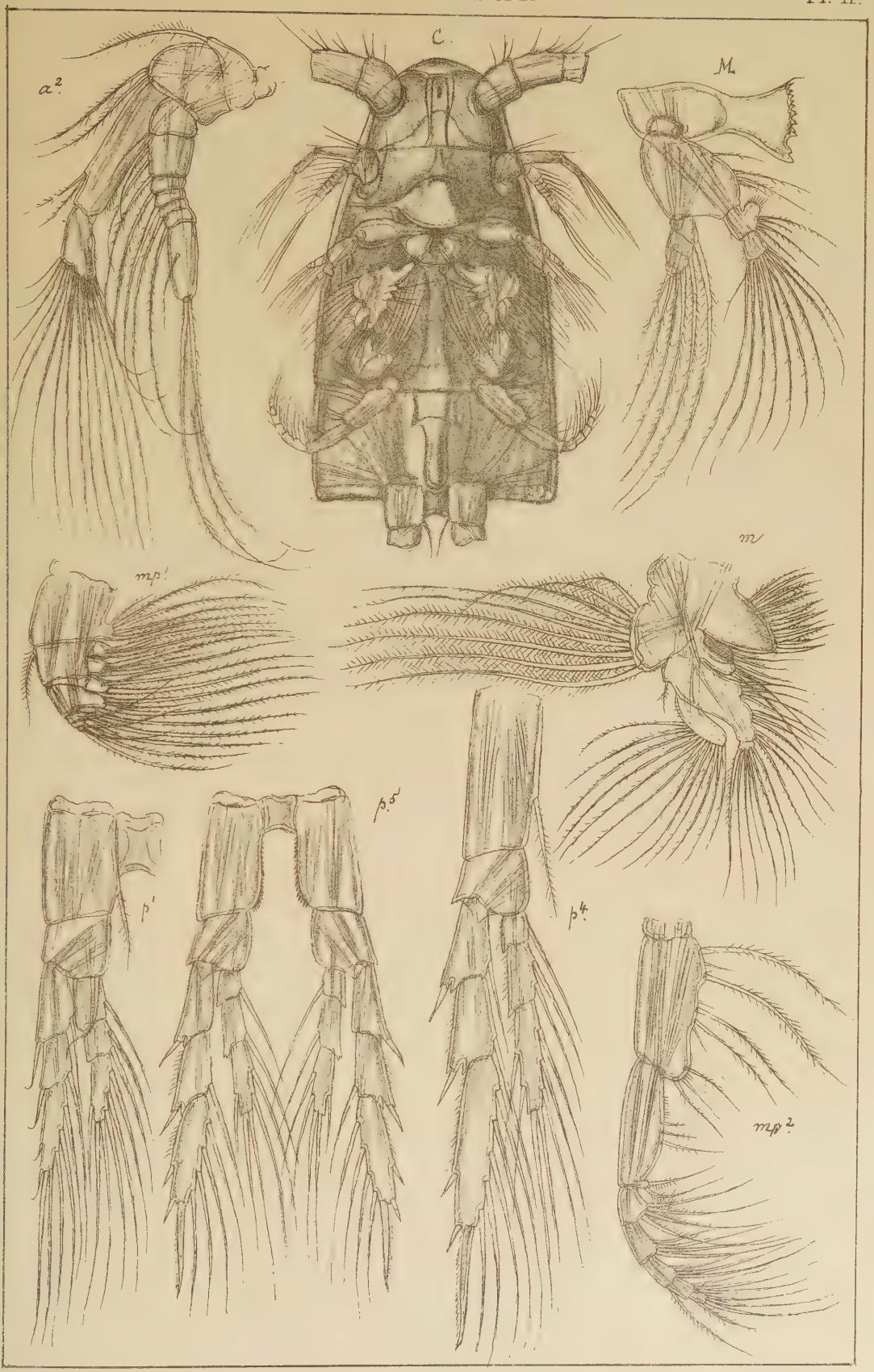


G.O. Sars autogr

Calanus finmarchicus, (Gunner.)

Trykt i den private Opmaaling, Chra.

Copepoda
Calanoida

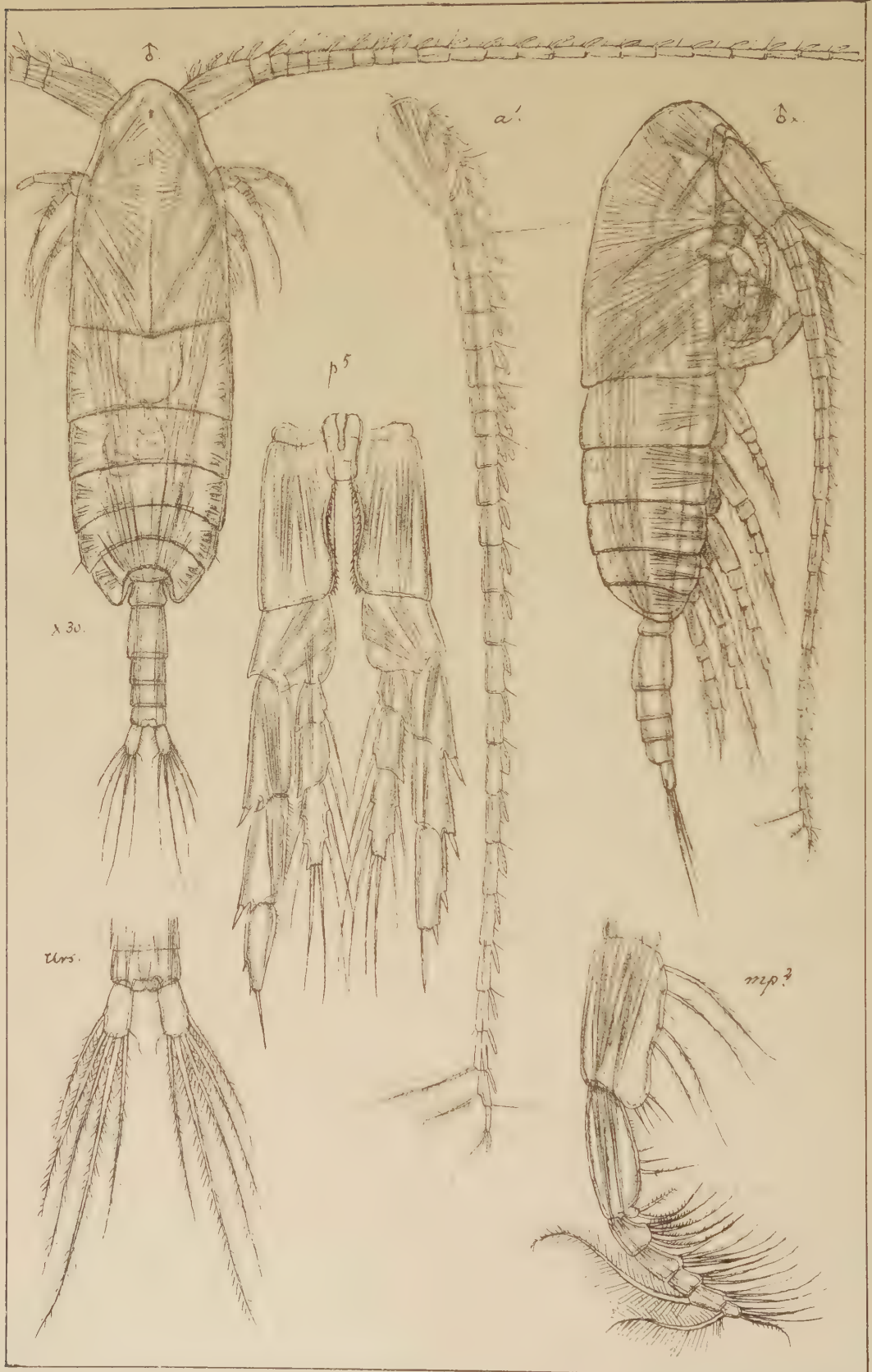


G.O. Sars autogr.

Trykt i den private Opmaaling, Chra.

Calanus finmarchicus, (Gunner.)
continued

Copepoda
Calanoida



G.O. Sars autogr.

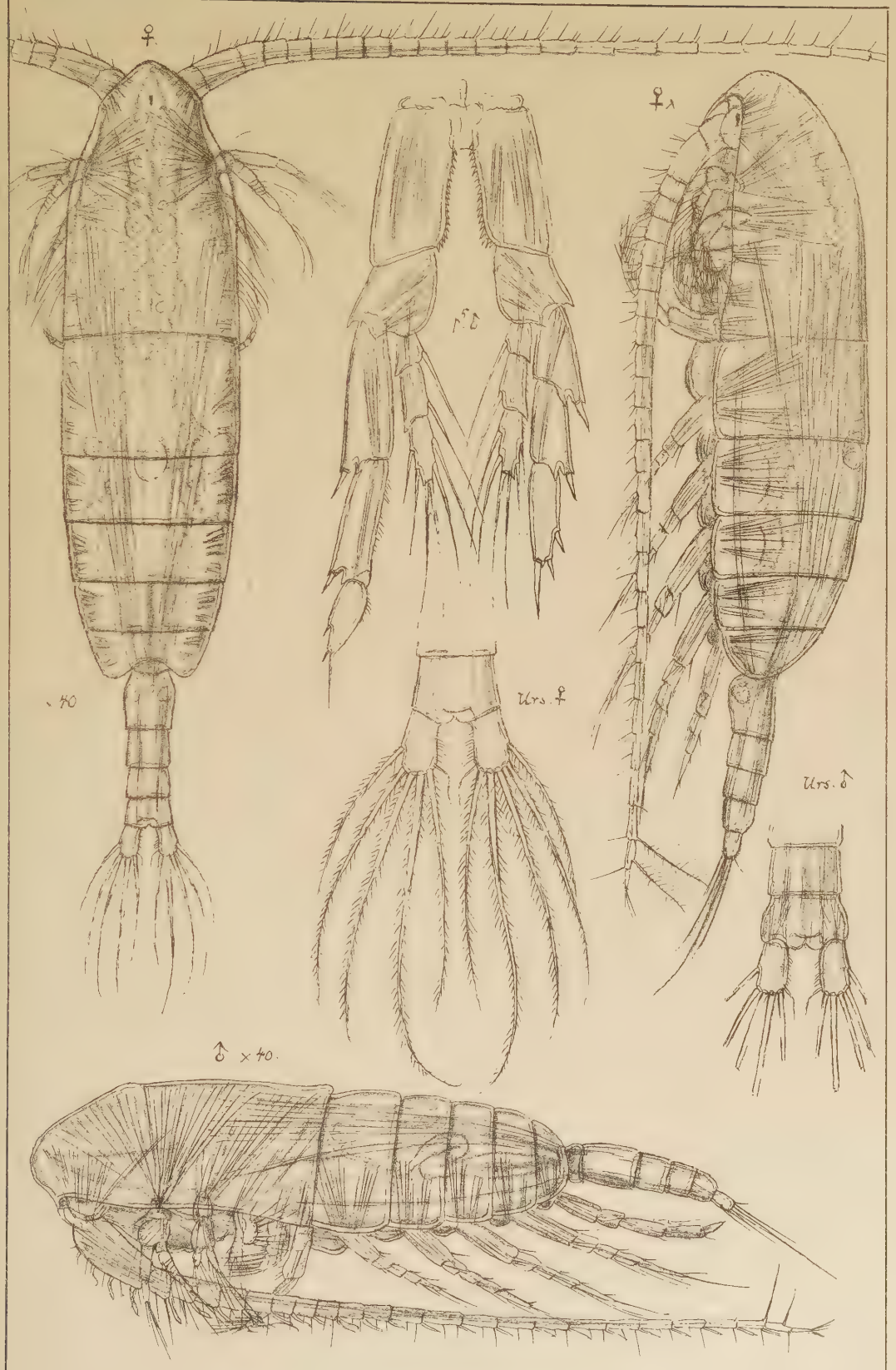
Calanus finmarchicus, (Gunner.)
(male.)

Trykt i den private Opmaaling, Chra.

Copepoda

Calanoida

Calanidæ. Pl. IIII.



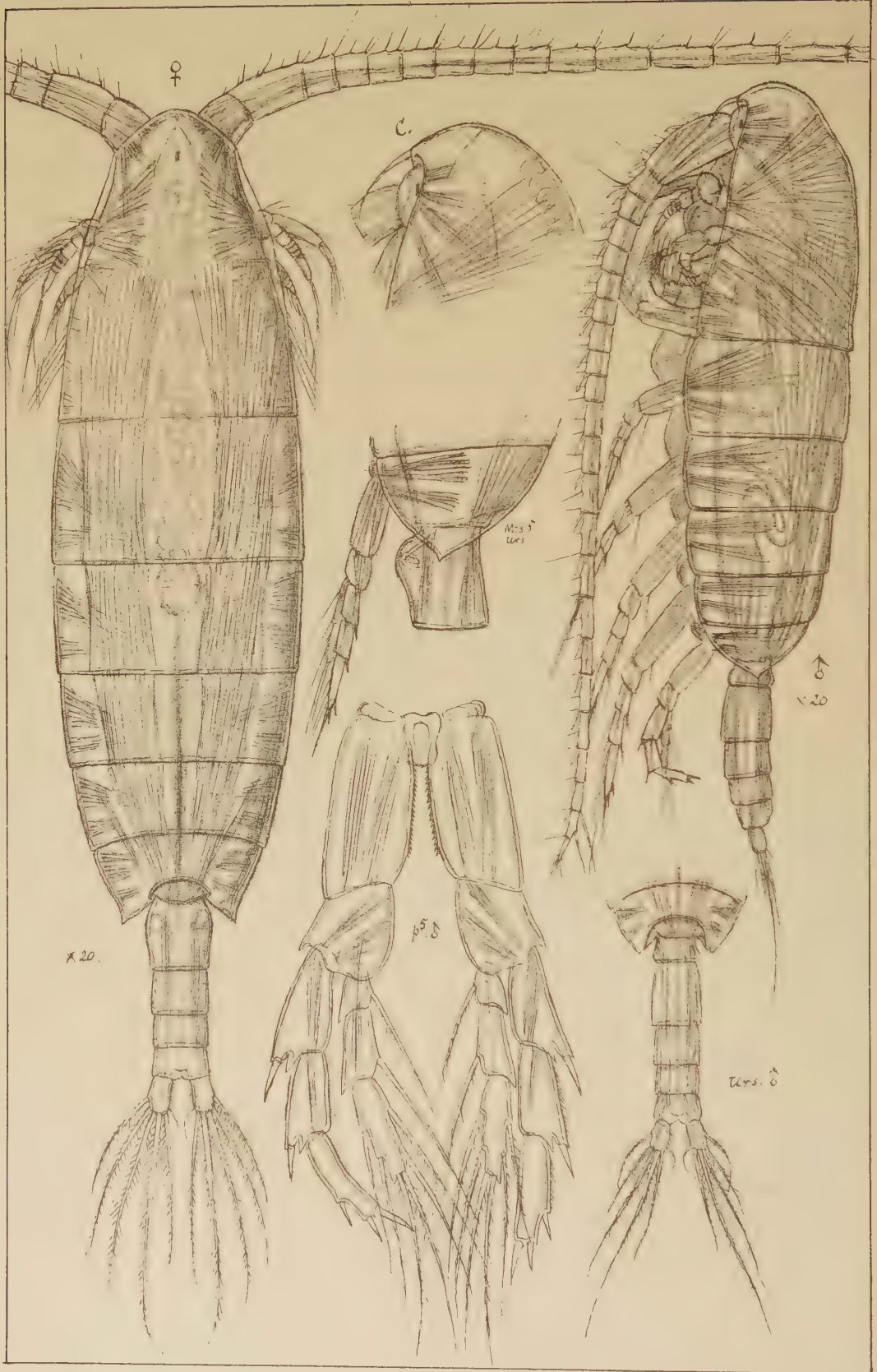
G.O. Sars autogr.

Trykt i den private Opmaaling, Chra.

Calanus helgolandicus (Claus.)

Copepoda

Calanoida



G.O. Sars autogr.

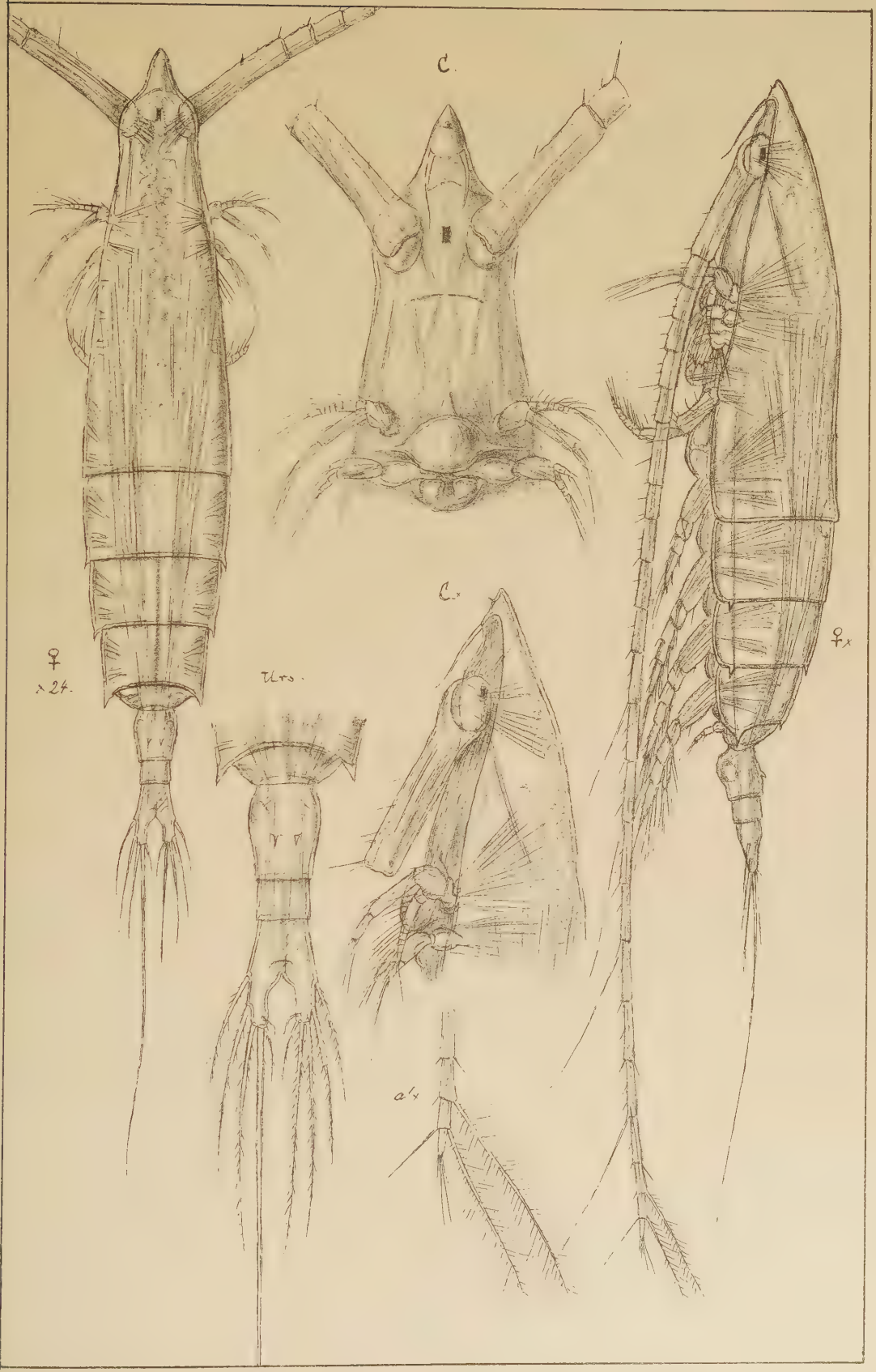
Trykt i den private Opmaaling, Chra.

Calanus hyperboreus, Kröyer.

Copepoda

Calanoida

Eucalanidæ. Pl. VI.



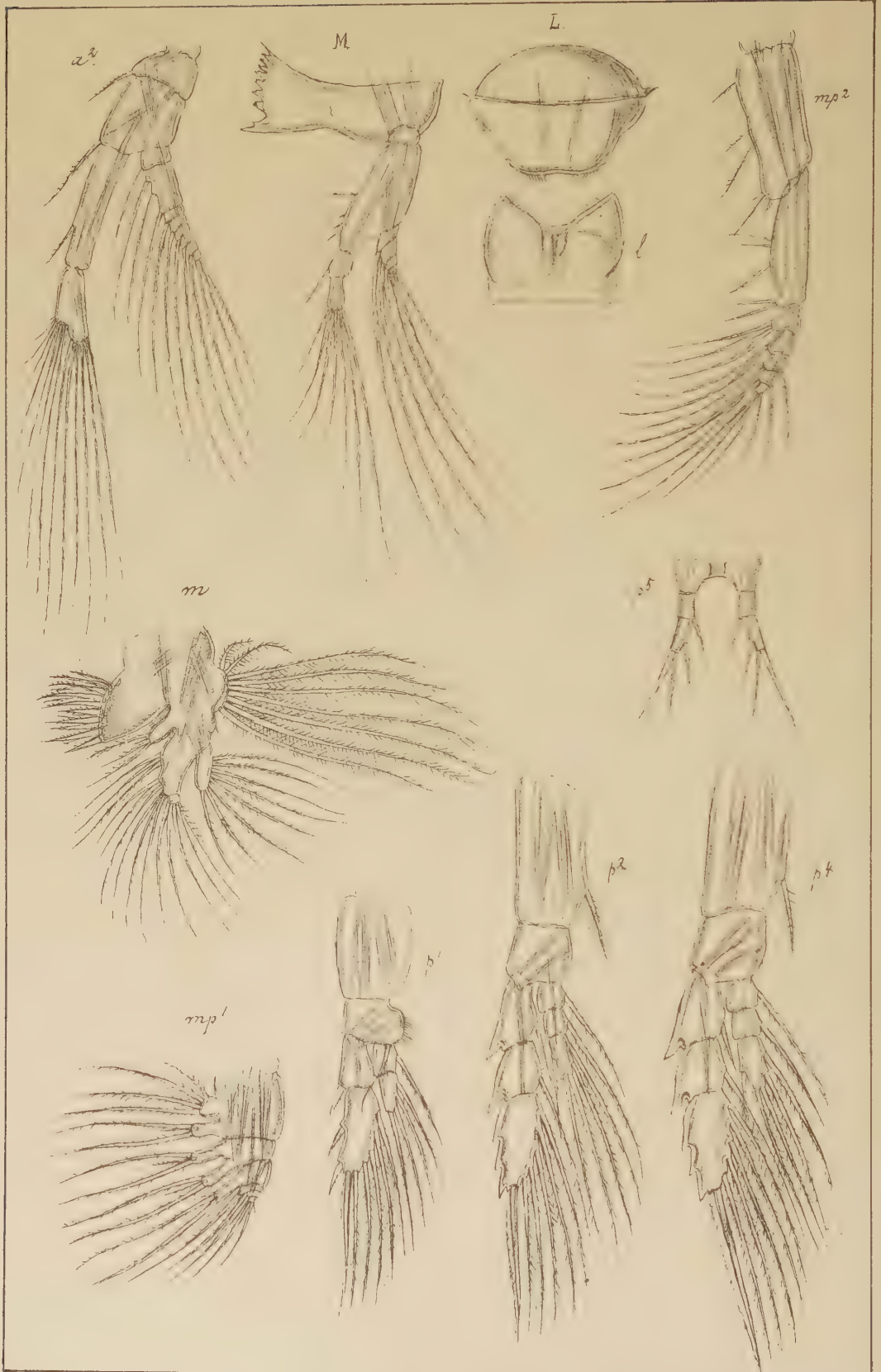
G.O. Sars autogr. Trykt i den private Opmaaling, Chra

Rhincalanus nasutus, Giesbr.

Copepoda

Calanoida

Eucalanidæ. PI. VII.



G.O. Sars autogr.

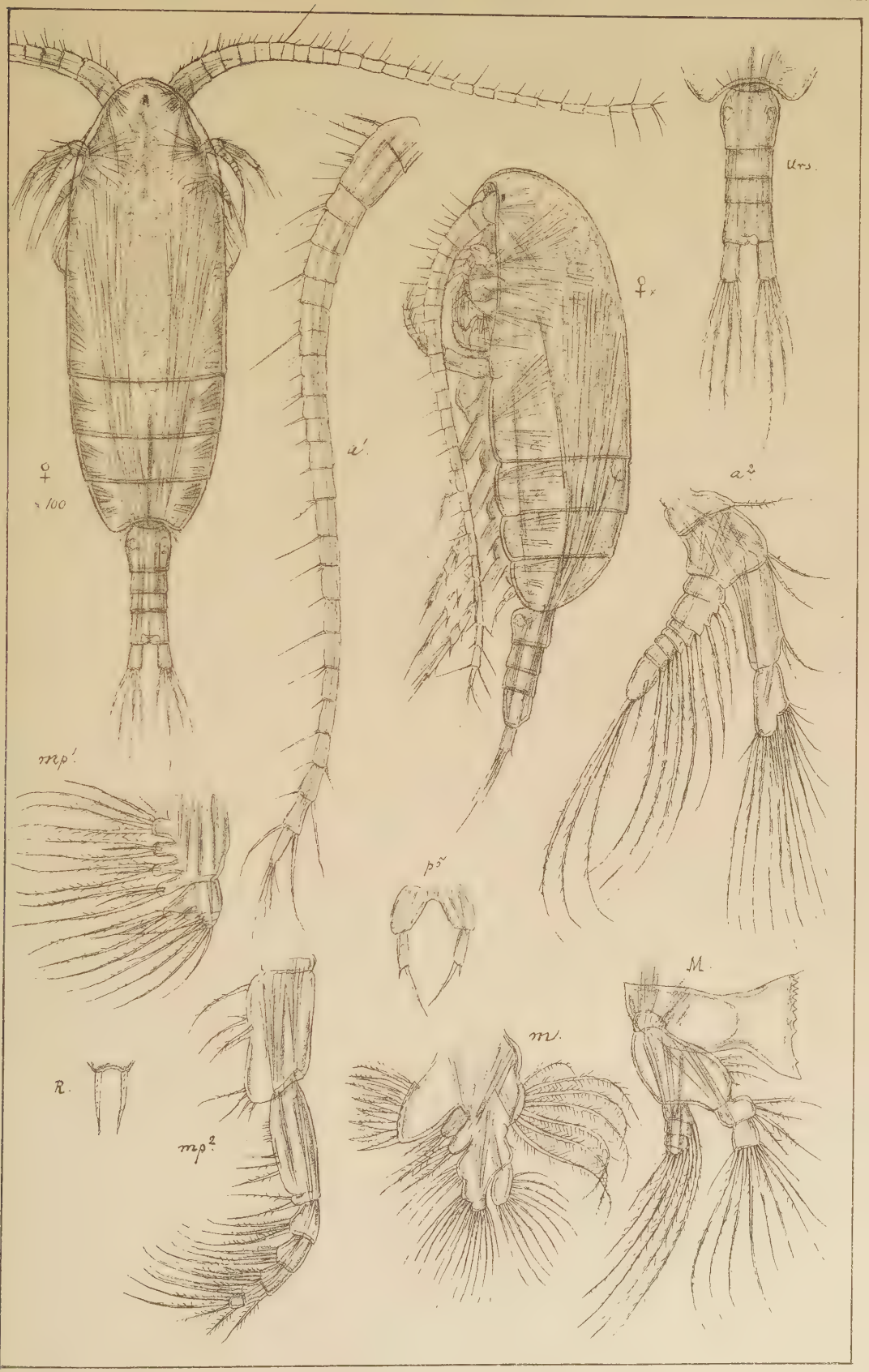
Rhincalanus nasutus, Giesbr.
continued

Trykt i den private Opmaaling, Chra.

Copepoda

Calanoida

Paracalanidæ. PI. VIII.



G.O. Sars autogr. Trykt i den private Opmaaling, Chra.

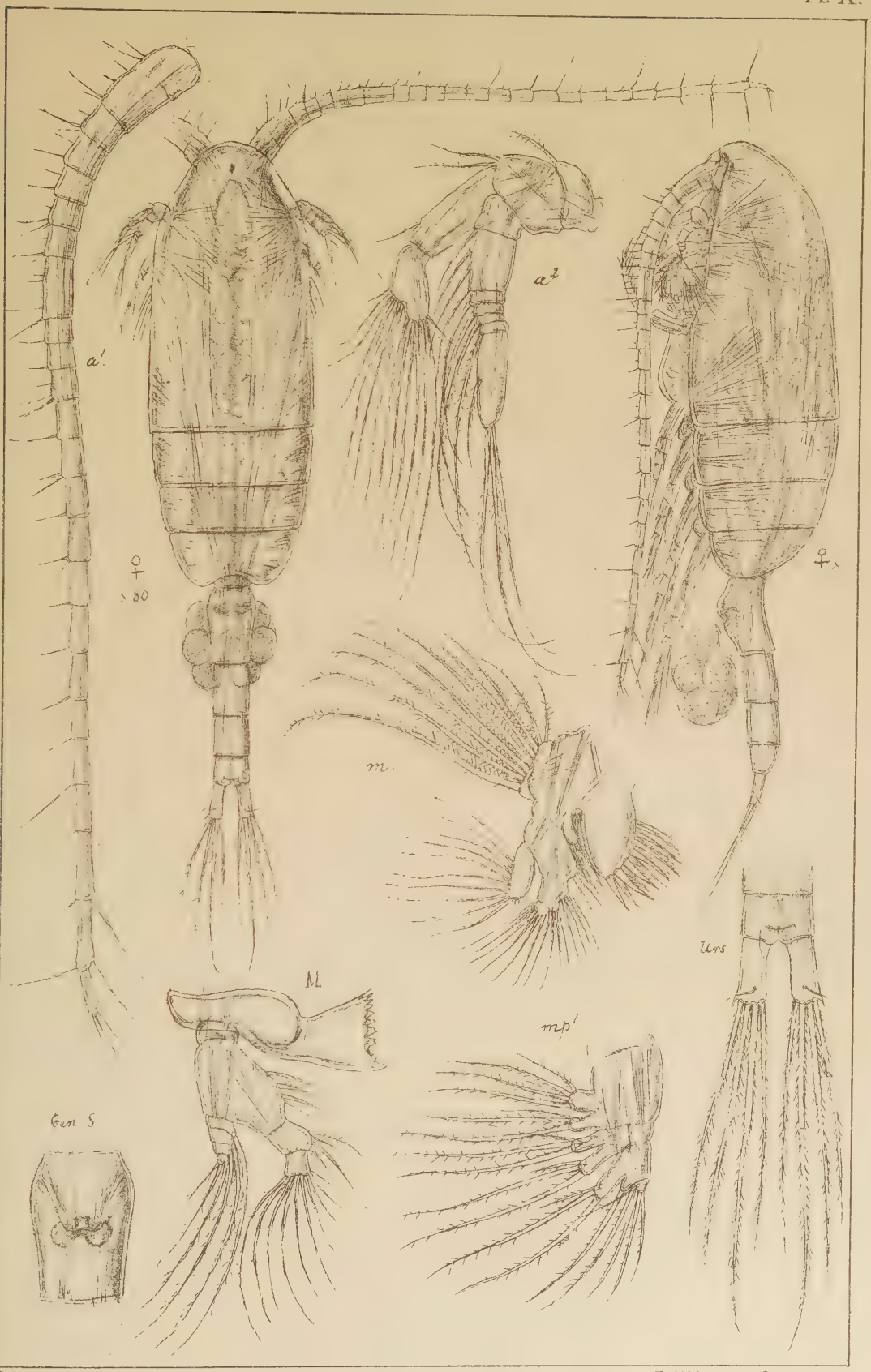
Paracalanus parvus (Claus.)

G.O. Sars autogr

Paracalanus parvus (Claus.)
continued

Trykt i den private Opmaaling, Chra.

Copepoda
Calanoida.



G.O. Sars autogr.

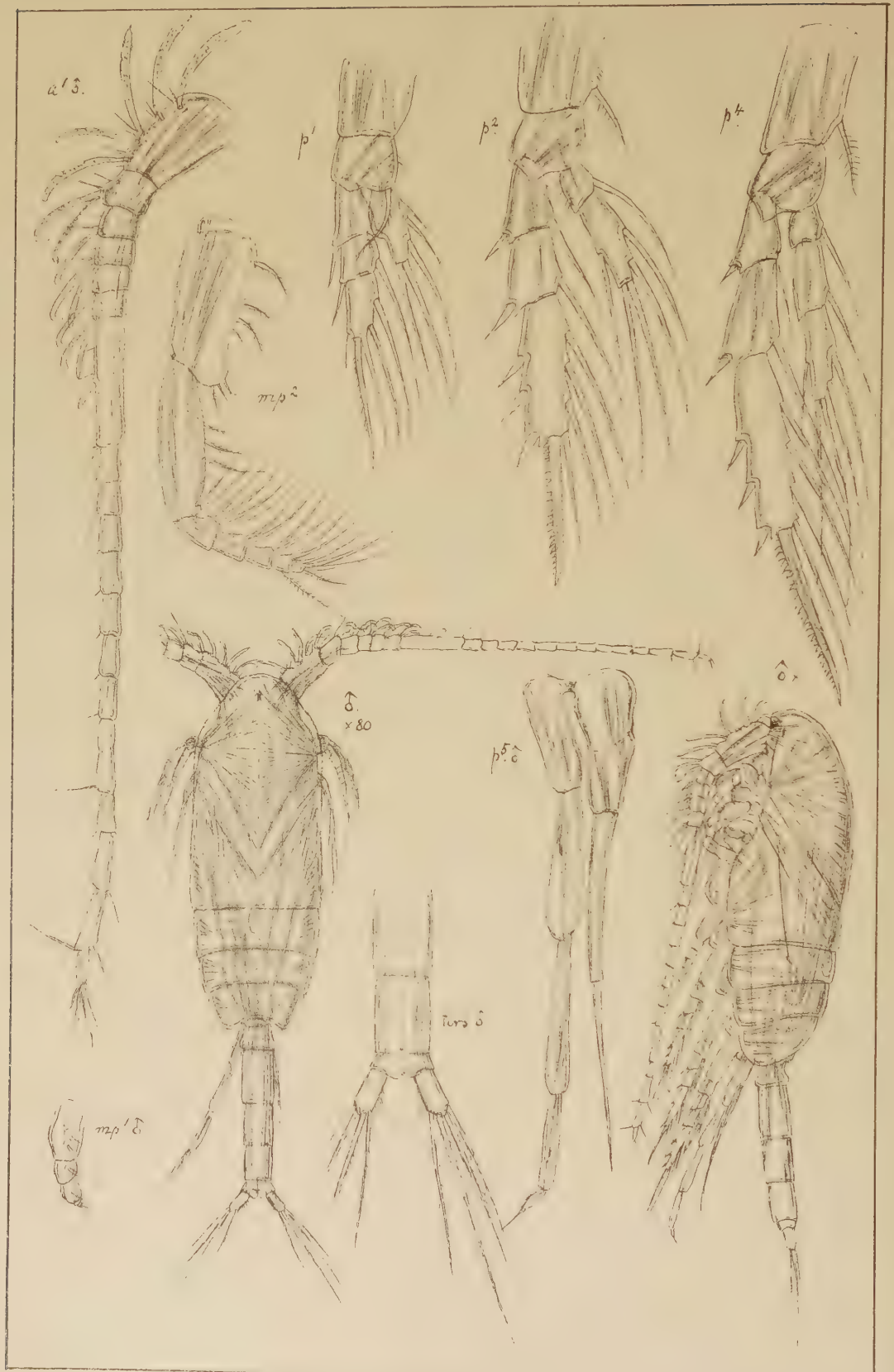
Trykt i den private Opmaaling Chra

Pseudocalanus elongatus, Boeck.

Copepoda

Calanoida.

Pseudocalanidæ. PI. XI.



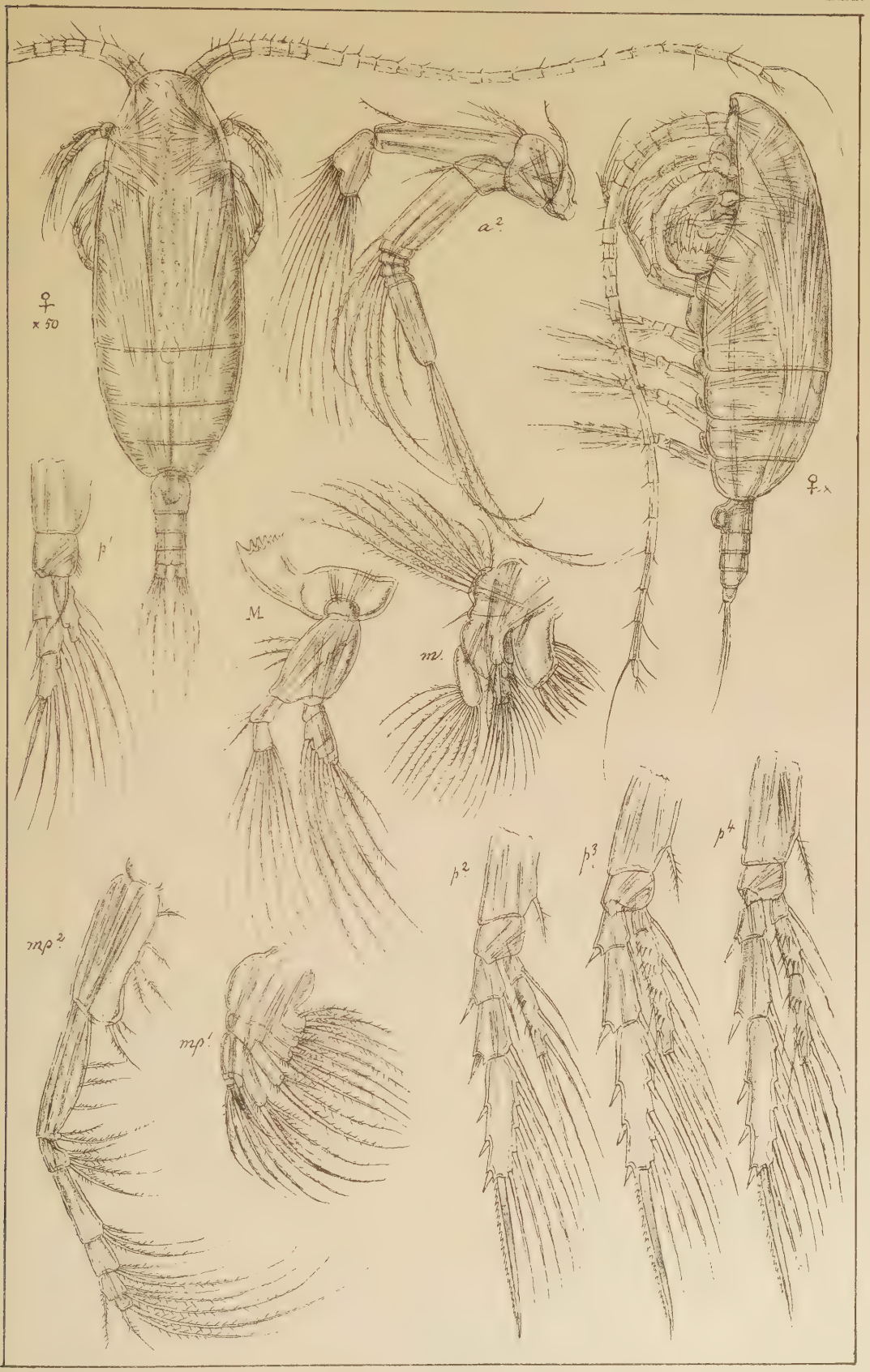
G.O. Sars autogr

Trykt i den private Opmaaling, Chra

Pseudocalanus elongatus, Boeck.
continued

Copepoda

Pseudocalanidæ. Calanoida. PI. XII.

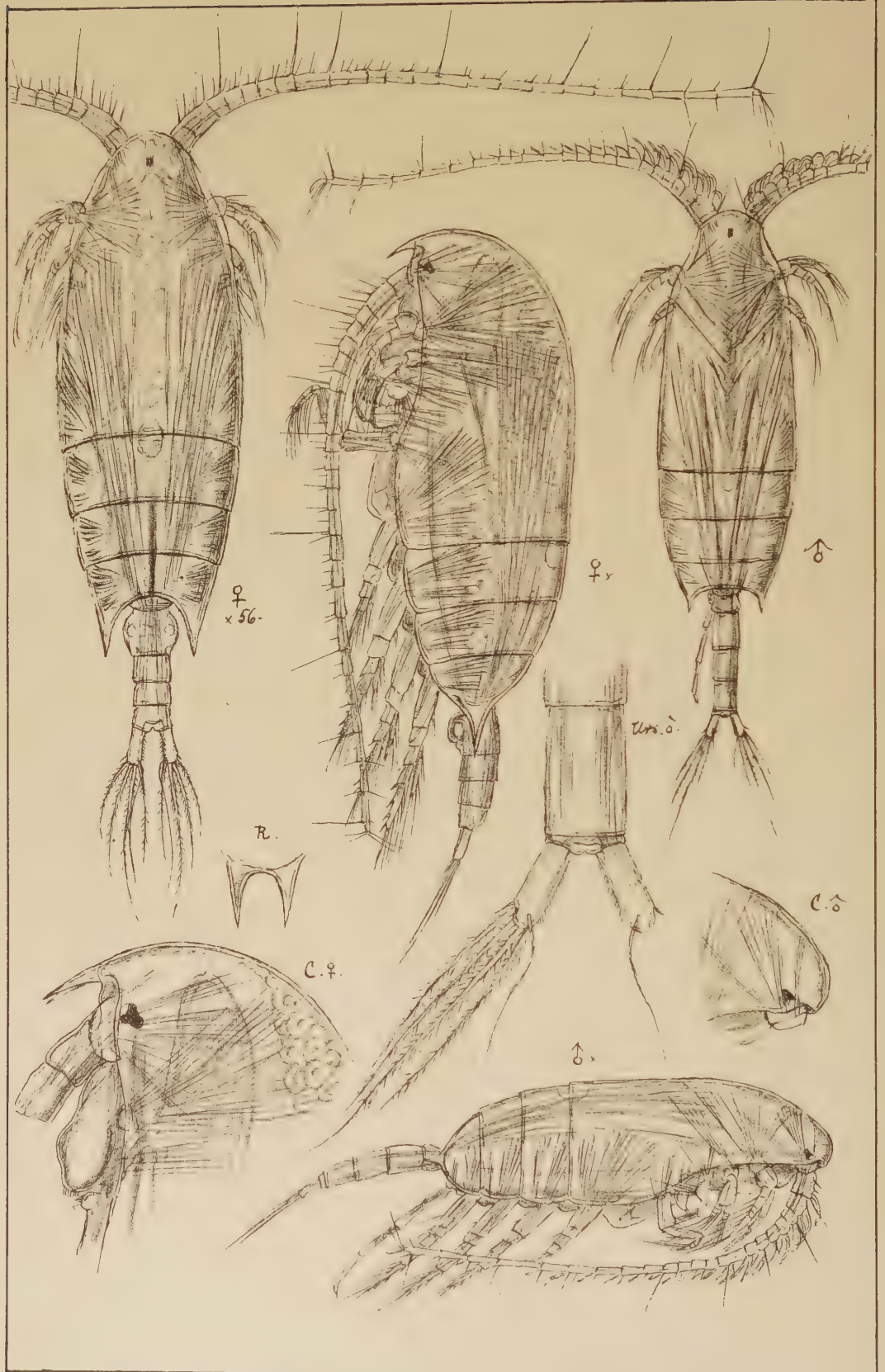


G. O. Sars autogr.

Trykt i den private Opmaaling, Chra

Spinocalanus longicornis, G. O. Sars.

Copepoda
Calanoida.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra.

Ætidius armatus, (Boeck.)

Copepoda
Calanoida.

G.O. Sars autogr.

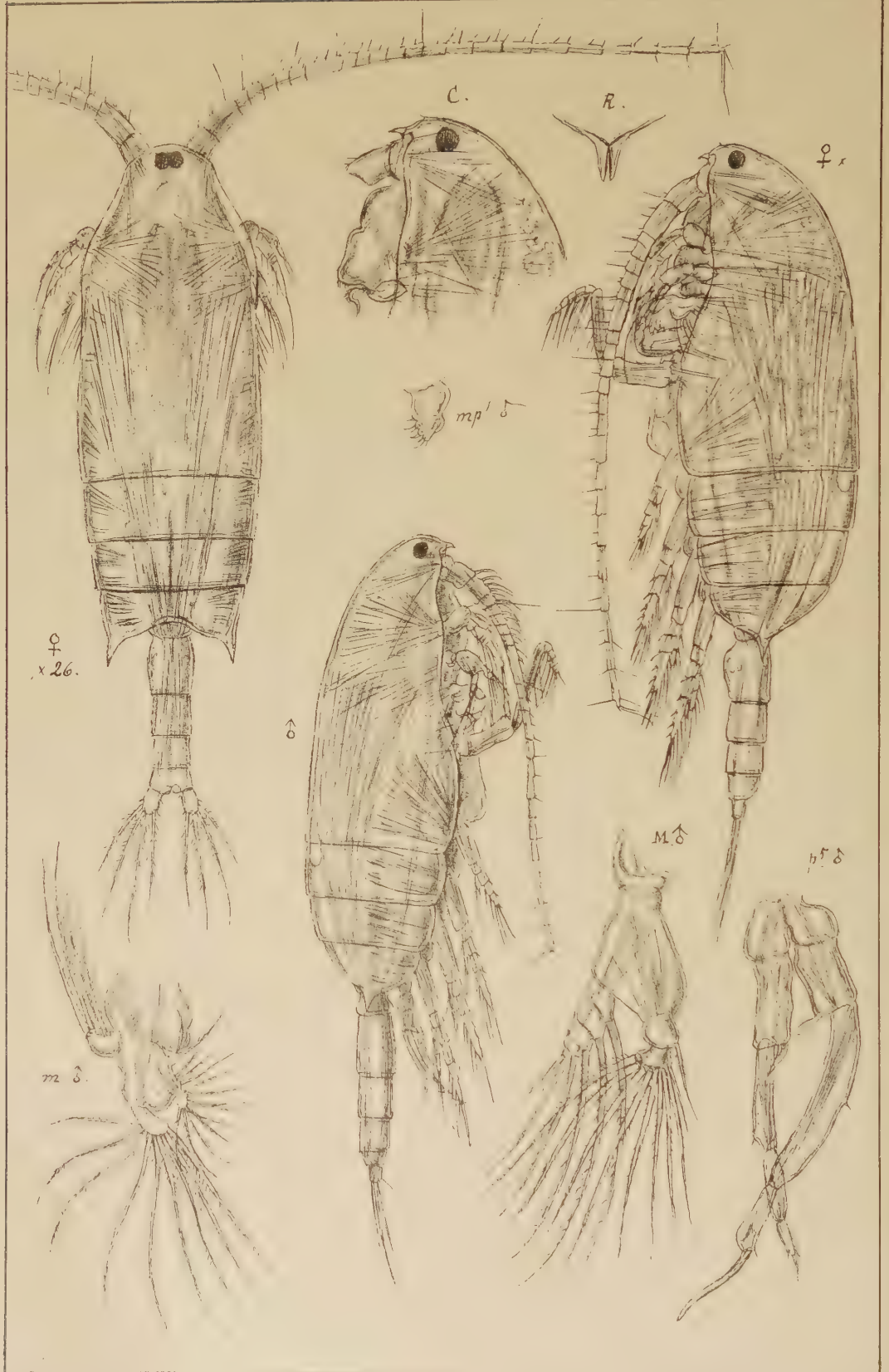
Trykt i den private Opmaaling, Chra

Ætidius armatus, (Boeck.)
continued

Copepoda

Calanoida.

Ætidiidæ. Pl. XV.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra.

Chiridius. armatus, (Boeck.)

Copepoda
Calanoida.

G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Chiridius. armatus, (Boeck.)
continued

abundance in almost all our deep fjords, from the Christiania Fjord up to the Vestfjord, but only in greater depths than 100 fathoms. It is accordingly, at any rate off the coast of Norway, a pronounced deep-water form, though it is very probable that in more northern latitudes it may ascend nearer to the surface.

Distribution.—Though I am much inclined to believe that this form is of arctic origin, the statements about its occurrence in the Arctic Ocean cannot be regarded as fully reliable, as it may very easily be confounded with the succeeding species. In the Polar basin investigated by Nansen, the present species did not occur.

10. Chiridius obtusifrons, n. sp.

(Pl. XVII.)

Chiridius armatus, G. O. Sars. The Norw. North Polar Expedition. Crustacea, p. 64, Pl. XVII (not Boeck.)

Specific Characters.—Female.—Very like the preceding species, though perhaps a little more slender of form. Front without any trace of a rostrum. Lateral corners of last segment of metasome, as in *C. armatus*, drawn out to comparatively short and slightly divergent acute projections. Urosome rather slender, attaining almost half the length of the anterior division; caudal rami somewhat more produced, exceeding in length the anal segment, and but slightly diverging. Anterior antennæ scarcely longer than the anterior division of the body. Posterior antennæ with the inner ramus rather short and stout, outer one fully twice its length. First pair of legs about as in *C. armatus*. Inner ramus of 2nd pair uniarticulate, of 3rd and 4th pairs imperfectly 3-articulate, the 2 basal joints being partly confluent. *Male* much smaller than the female, but otherwise resembling that of *C. armatus*. Last pair of legs, however, much more slender, and without any trace of an inner appendage to the 2nd joint. Length of adult female 4.20 mm., of male 2.90 mm.

Remarks.—As stated above, this form was at first regarded by the present author as identical with Boeck's species, to which it certainly bears a perplexing resemblance. On a closer comparison, I have however found that in reality it differs in some points so very markedly, that it ought more properly to be regarded as a distinct species, for which the specific name *obtusifrons* is here proposed, derived from the fact of the total absence of any rostral projection on the front. Moreover, the urosome appears considerably more elongated in the female, and the caudal rami are likewise somewhat more produced. On the other hand, the anterior antennæ are comparatively shorter, and in the 2nd pair of legs the inner ramus is uniarticulate, as in the 1st pair, without any trace of a subdivision.

The male, too, differs conspicuously not only in its small size, but also in the much more feeble and simple structure of the last pair of legs.

Occurrence.—Specimens of this arctic species were found in some of the plankton-proofs taken last year during the cruise of the "Michael Sars". It occurred at 2 different Stations (Nos. 8 & 9), located in the open sea, about midway between Iceland and Norway, the depth being recorded to be from 200 to 800 metres. Considering these finding-places, I feel justified in refering the present species to the fauna of Norway, though it has not as yet been found in the immediate vicinity of the coast.

Distribution.—The Polar basin crossed by Nansen, in many places rather abundantly, from the surface down to a depth of 300 metres.

11. Chiridius tenuispinus, G. O. Sars.

(Pl. XVIII.)

Chiridius tenuispinus, G. O. Sars, The Norw. North Polar Expedition. Crustacea, p. 67, Pl. XVIII.

Specific Characters.—Female.—Body comparatively less slender than in the 2 preceding species, with the urosome much shorter, scarcely exceeding in length $^1/_4$ of the anterior division. Front projecting below in a sharply-pointed, but short rostrum. Last segment of metasome produced on each side to a very slender spiniform process pointing straight behind. Caudal rami comparatively short, only slightly longer than they are broad, and rounded at the tip. Anterior antennæ, when reflexed, reaching about to the end of the 2nd caudal segment. Posterior antennæ with the inner ramus rather produced and very narrow, though shorter than the outer. Posterior maxillipeds still more slender than in the 2 preceding species. First pair of legs having the 1st joint of the outer ramus confluent with the 2nd, and without any spine outside. Inner ramus of 2nd pair distinctly biarticulate, that of the 2 succeeding pairs 3-articulate, with all the joints well defined. *Male* unknown. Length of adult female 3.80 mm.

Remarks.—This species, first described by the present author from Nansen's Polar Expedition, is closely allied to a form recorded by Dr. Giesbrecht from the Pacific under the name of *Gaïdius pungens*, and both these forms are unquestionably congeneric. The northern form differs, however, in the more slender form of the spiniform projections issuing from the last segment of the metasome, and more especially in the fact, that the inner ramus of the 2nd pair of legs is distinctly biarticulate, whereas in the Pacific species it is uniarticulate. In my opinion the ganus *Gaïdius* can scarcely be supported, as the characters upon which it is founded, have proved to vary in different species of the present genus. I have

hitherto only seen female specimens of this form. The male may undoubtedly be assumed to exhibit some difference from those of the 2 preceding species, at least in the structure of the last pair of legs.

Occurrence.—Some specimens of this form were found in the same plankton-proofs in which *C. obtusifrons* occurred (Stats. 8 & 9 of the cruise of the "Michael Sars"), and moreover at Stat. 34, located considerably farther north, at some distance east of Jan Mayen, the depth at the last-named Station being recorded to be from 500 to 1000 metres. Judging from the above-mentioned occurrences, I think that the present species ought to be referred to the fauna of Norway, an opinion which has been still further confirmed by recent investigations of Mr. Nordgaard, who has found a solitary specimen in a plankton-proof taken in the year 1899 in the Ofoten Fjord.

Distribution.—Not unfrequent at 6 different Stations in the Polar basin explored by Nansen. At one of the Stations it occurred at the very surface of the sea, at the others at some depth below the ice.

Gen. 8. **Undinopsis,** G. O. Sars, 1884.

Syn: *Bradyidius,* Giesbrecht, Scott.

Generic Characters.—Body in female comparatively robust, in male somewhat more slender. Cephalosome, as in the other forms of this family, coalesced with the 1st segment of metasome, front terminating below in a distinctly bifurcate rostrum. Last segment of metasome produced on each side to a strong, posteriorly-pointing projection. Urosome in female comparatively short, in male more slender, with shortened anal segment. Caudal rami likewise short and of a structure similar to that in *Chiridius.* Eye distinct, longitudinal. Anterior antennæ in female not very slender, 24-articulate, with the last articulation well defined, bristles of the anterior edge unusually strong, partly annulated, and curved in different directions, those at the tip more or less distinctly ciliated; same antennæ in male comparatively more slender, with band-like sensory appendages on the proximal part. Posterior antennæ with the rami not very unequal in length. Oral parts on the whole resembling those in *Chiridius;* posterior maxillipeds, however, considerably more robust. Natatory legs very strongly built, inner ramus of 1st pair uniarticulate, of 2nd pair biarticulate, of the 2 succeeding pairs 3-articulate. Last pair of legs in male slender, more or less asymmetrical.

Remarks.—This genus was proposed many years ago by the present author,

to include the form erroneously identified by Brady with *Pseudocalanus armatus*, Boeck. As, however, no description was given, the generic name *Undinopsis* was overlooked, and replaced in 1897 by Dr. Giesbrecht with that of *Bradyidius*. I think, however, that I am justified in maintaining the name at first given by me to this genus. In most of the anatomical details it agrees rather closely with the genus *Chiridius*, although differing rather markedly in a few points. The anterior antennæ in the female, for instance, are of a very different appearance, owing to their much coarser structure and the dense supply of unusually strong bristles, which give them a peculiar hirsute appearance. In the relative length of the rami of the posterior antennæ, and in the robust form of both the posterior maxillipeds and the natatory legs this genus also differs conspicuously from *Chiridius*. The genus comprises 2 nearly-allied species, both of which exactly agree in habits, and, unlike what is generally the case with the Calanoida, are true bottom-forms, never found except close to the ground.

12. Undinopsis Bradyi, G. O. Sars.

(Pl. XIX, XX).

Undinopsis Bradyi, G. O. Sars, in Sp. Schneider's Report of Invertebrata from the Kvænangen Fjord, 1884.

Syn: *Pseudocalanus armatus Brady* (not Boeck).
„ *Bradyidius armatus*, Giesbrecht, Scott.

Specific Characters.—Female. Anterior division of body, seen dorsally, oval fusiform in shape, greatest width considerably exceeding $^1/_3$ of the length, and occurring in the middle, both extremities about equally narrowed; seen laterally, moderately vaulted above, frontal part obtusely truncated anteriorly, and projecting below to a small, but highly chitinised and distinctly bifurcate rostrum. Lateral projections of last segment of metasome very strong, mucroniform, and slightly divergent, reaching beyond the genital segment. Urosome not nearly attaining $^1/_3$ of the length of the anterior division, genital segment slightly incrassated, though not very protuberant below. Caudal rami scarcely longer than they are broad, and rounded at the tip, apical setæ distinctly biarticulate and very much elongated, especially the innermost but one. Eye in the living animal very conspicuous, bright red, and oblong in form. Anterior antennæ about the length of the anterior division of body, all articulations very sharply defined, with the bristles strongly developed, especially the distal ones, which form together a dense brush. Posterior antennæ with the outer ramus scarcely longer than the inner. Inner ramus of 2nd to 4th pairs of legs with scattered small spinules on the posterior face.

Male considerably more slender than female, with the lateral corners of last segment of metasome far less produced. Urosome very narrow, with the last segment much shortened; caudal rami generally spread to each side. Anterior antennæ rather slender, with the number of articulations considerably reduced. Last pair of legs simple, without any trace of an inner ramus, left leg very slender, right leg rudimentary, scarcely more than $^1/_3$ as long as the left, and 3-articulate, last joint conically produced at the tip.

Colour. Body pellucid, with a faint yellowish tinge, and in female variegated with scattered light red patches, partly confluent into transverse bands; intestine translucent with a dark ochraceous hue; ovaries purple-coloured.

Length of adult female 2.65 mm., of male 2.20 mm.

Remarks.—This is unquestionably the form described by Brady as *Pseudocalanus armatus*, Boeck. Since this identification of Brady has turned out to be wrong, another specific name should of course have been assigned to the present species, the more so as the name *armatus* has been used for two other forms belonging to the present family, viz., *Ætideus armatus* and *Chiridius armatus*. I therefore think that the name *Undinopsis Bradyi*, long ago proposed by the present author for this form, ought to be peferred to that of *Bradyidius armatus* used by most other authors.

Occurrence.—I have met with this form in several places on the Norwegian coast, from the Christiania Fjord to Vardø. It is only found close to the ground in depths ranging from 20 to 40 fathoms, muddy bottom, and accordingly cannot, as a rule, be taken with the ordinary surface-net, but only by the aid of the dredge. In order to get specimens in uninjured condition, the dredge must, however, be of a very light kind and so constructed, that it only sweeps the bottom, without being filled up with mud. By the aid of such a dredge I have succeeded in obtaining this form rather abundantly in some places, and have not infrequently had the opportunity of examining it in the living state. Like most other Calanoids, it moves in two different manners, now proceeding quite slowly by rapid vibrations of the posterior antennæ and the mandibular palps, now making abrupt bounds by energetic strokes of the powerful natatory legs. When kept for observation in a glass bottle with a small quantity of mud, it is always found to keep close to the bottom, moving about along the mud in a horizontal direction. By far the greater number of specimens obtained are of the female sex. Male specimens are extremely rare, and seem only to occur at certain seasons.

Distribution.—British Isles (Brady, Scott), Greenland (Vanhöffen).

13. Undinopsis similis, G. O. Sars, n. sp.

(Pl. XXI).

Specific Characters.—Female. Very like the preceeding species in external appearance, though perhaps somewhat more robust of form. Lateral projections of last segment of metasome comparatively short, scarcely reaching beyond the middle of the genital segment. Anterior antennæ likewise shorter than in *U. Bradyi,* not nearly attaining the length of the anterior division, otherwise of a structure very similar to that of the said species. Posterior antennæ with the outer ramus distinctly longer than the inner. Inner ramus of 2nd to 4th pairs of legs without any spinules on the hind face.

Male resembling that of the type species; the anterior antennæ, however, less slender, and with all the articulations well defined. Both legs of 5th pair well developed, and having at the end of the 2nd joint inside a styliform appendage (inner ramus), right leg considerably stronger than left, and terminating in an incurved claw.

Colour about as in *U. Bradyi*, though with less distinct pigmentation.

Length of adult female 3.00 mm., of male 2.40 mm.

Remarks.—This form so very closely resembles the type species in its external appearance, that it may easily be confounded with it, and, indeed, it is only quite recently that I have been aware of its specific distinctness. On a closer examination, however, several well-marked differences are found to exist in both sexes, proving it to be in reality a well-defined species. Thus in the female the lateral projections of the last segment of the metasome are far less produced, and the anterior antennæ comparatively shorter. In the male these antennæ are also less slender than in the male of *U. Bradyi,* differing, moreover, in the fact that all the articulations are well defined, whereas in the type species some of them are coalesced. Finally, the last pair of legs in the male exhibit a very different appearance from those in *U. Bradyi*, the right leg, which in that species is rudimentary, being here considerably stronger than the left, both legs having, moreover, a well-marked rudiment of an inner ramus that is wholly wanting in the type species.

Occurrence.—I have found this form not unfrequently in the inner part of the Stavanger Fjord, at Jelsö and Sunde. Like the preceeding species, it only occurred close to the ground, and was accordingly captured by the aid of the dredge, the depth ranging from 50 to 100 fathoms. It is very probable, that this form also occurs in other places upon our coast; but having formerly confounded it with *U. Bradyi,* I am unable at present to state the localities with certainty.

Gen. 9. **Bryaxis**, Boeck, M. S.

Generic Characters.—Body short and robust, with the anterior division considerably tumefied. Cephalosome wholly confluent with the 1st pedigerous segment, and having the lower edges deeply insinuate at the oral region, front without any trace of a rostrum below. Lateral corners of last segment of metasome produced to acute lappets. Urosome nearly as in *Undinopsis*. Eye wholly absent. Anterior antennæ comparatively short and robust, 24-articulate, and densely clothed with ciliated bristles. Posterior antennæ with the outer ramus poorly developed. Mandibles with the palp exceedingly large, rami very unequal. Maxillæ and anterior maxillipeds about as in *Undinopsis*. Posterior maxillipeds very largely developed, with a peculiar sensory appendage at the end of the 1st basal joint. Legs of a structure similar to that in *Undinopsis*. Male unknown.

Remarks.—This genus, to which the M. S. name *Bryaxis* had been applied by Boeck, is allied to *Undinopsis*, although it differs rather markedly in the absolute absence of both rostrum and eye, as also in the structure of the posterior antennæ, mandibles and posterior maxillipeds. It contains as yet only a single species, to be described below.

14. Bryaxis brevicornis, Boeck, M. S.

(Pl. XXII, XXIII).

Specific Characters.—Female. Anterior division of body, seen dorsally, regularly elliptical in outline, greatest width nearly attaining half the length, anterior extremity evenly rounded, posterior somewhat contracted; seen laterally, evenly vaulted anteriorly, front obtuse, without any trace either of a rostrum or tentacular appendages below, inferior edges of cephalosome remarkably inflexed in the middle. Lateral lappets of last segment of metasome very acute and obliquely upturned. Urosome scarcely attaining $^1/_3$ of the length of the anterior division. Caudal rami short, rounded at the tip, apical setæ rather elongated. Anterior antennæ much shorter than the anterior division of the body, all the articulations sharply defined and clothed with very strong, ciliated bristles. Posterior antennæ with the outer ramus not even attaining half the length of the inner, and 6-articulate, last joint very small, with the apical setæ rudimentary. Inner ramus of mandibular palp poorly developed, with only 4 apical setæ. Sensory appendage of posterior maxillipeds club-shaped. Colour bright yellow. Length of adult female 2.60 mm.

Remarks.—In the notes on Copepoda left by Boeck this form is named as above. No description however, has, been published, and the figures accompanying the notes are, as far as this form is concerned, copies from some drawings long ago executed by the present author. It would seem therefore, that Boeck himself had not observed this Calanoid. The present form may be at once distinguished from the others belonging to the family *Ætideidæ*, by its unusually short and robust body and the comparatively short and densely setiferous anterior antennæ. Moreover, the upturned acute lateral lappets of the last segment of the metasome distinguish it very conspicuously.

Occurrence.—I have met with this peculiar Calanoid in several places off the Norwegian coast, from the Stavanger Fjord to Apelvær (Namdal), but only in greater depths ranging from 50 to 150 fathoms. Like the species of the genus *Undinopsis,* it is a true bottom-form, always keeping close to the ground, and accordingly only to be obtained by the aid of the dredge. I have several times had an opportunity of observing this form in the living state. It moves in a peculiar revolving manner, chiefly by the aid of the posterior antennæ and the powerfully developed mandibular palps, only now and then making an abrupt bound by the action of the natatory legs. All the specimens which I have seen, are of the female sex. The male, when once detected, wille undoubtedly exhibit some additional distinguishing character of the present genus. Out of Norway this form has not yet been observed.

Fam. 6. Euchætidæ.

Characters.—Cephalosome coalesced with the 1st pedigerous segment, or at any rate imperfectly defined from it, front projecting in an acute, undivided rostrum. The last 2 segments of metasome united. Urosome consisting in female of 4 segments, the last of which, however, is very small, genital segment more or less protuberant below. Caudal rami short, with the outermost marginal seta rudimentary, appendicular bristle issuing from the inner corner of the rami, and generally much elongated. Anterior antennæ slender, with some of the bristles of the anterior edge very long and extending in different directions; those of male provided at the base with strongly developed sensory appendages. Posterior antennæ and mandibles normal. Maxillæ with the palp incurved in an unusual manner. Both pairs of maxillipeds very powerfully developed; the posterior ones

especially unusually strong, with the terminal part reflexed and armed with long claw-like spines. Oral parts in male much degenerated. Natatory legs powerfully developed, and on the whole resembling in structure those in the *Ætideidæ*. 5th pair of legs wholly wanting in female, those in male exceedingly large and powerful. Ovisac present in female.

Remarks.—This family as yet only comprises a single genus, viz., *Euchæta*, Philippi, which, however, exhibits some very conspicuous structural differences from the other *Amphascandria*. The genus was also regarded by Dr. Giesbrecht as the type of a particular subfamily, *Euchætinæ*, which I now propose, in accordance with the plan followed in this account, to raise to the rank of a true family.

Gen. 10. **Euchæta**, Philippi, 1852.

Generic Characters.—Body comparatively slender, especially in the male, with the cephalosome attenuated in front, rostrum pointing in female obliquely forwards, in male more downwards, and having at the base in front a more or less projecting ledge. Lateral corners of last segment of metasome rounded off, and generally densely clothed with hairs below. Urosome, as a rule, more elongated than in the *Ætideidæ*, genital protuberance in female very prominent, and of different form in the different species. Caudal rami in female firmly connected with the last caudal segment, in male mobile, marginal setæ spread in a fan-like manner and beautifully plumous, the innermost but one much longer than the others, appendicular bristle generally very slender, hair-like and geniculate at the base. Eye small, subventral. Anterior antennæ in female 24-articulate, 3rd, 7th, 8th and 13th articulations each carrying an unusually long bristle at the end anteriorly; terminal articulation very small, with a long reflexed seta on the tip. Epistome produced in front of the anterior lip to a knob-like, densely hirsute projection. Anterior maxillipeds with the spines of the terminal part very strong, claw-like. Posterior maxillipeds with the 2nd basal joint very large, fusiform, attenuated distally. Both pairs in male much reduced in size. 1st pair of legs much smaller than the others, and having the first 2 joints of the outer ramus confluent in female. Inner ramus of the first 2 pairs of legs uniarticulate, of the 2 succeeding pairs 3-articulate. Both legs of last pair in male well developed; right leg with a long styliform inner ramus, outer ramus biarticulate, with the distal joint claw-like; left leg terminating in a complicated hand, by which the spermatophore is seized.

Remarks.—This genus was established in the year 1852 by Philippi, to comprise the Mediterranean form recorded by Prestandrea as *Cyclops marinus*. Subsequently several additional species have been described, some of which, however, have justly been removed by Dr. Giesbrecht, and referred to particular genera of the family *Ætideidæ*. A considerable number of species are still left, amounting to about 16 in all. To the Norwegian fauna belong 3 species, to be described below, all of which are remarkable from their large size, representing in fact the largest known Calanoids.

15. Euchæta norvegica, Boeck.

(Pl. XXIV, XXV, XXVI).

Euchæta norvegica, Boeck. Nye Slægter og Arter af Saltvandscopepoder. Chr. Vid. Selsk. Forh. 1872, p. 40.

Syn: *Euchæta Prestandreæ*, Boeck (not Philippi).
„ — *carinata*, Moebius.

Specific Characters.—Female. Form of body rather slender. Anterior division, seen dorsally, oblong fusiform in outline, greatest width about equalling $^1/_3$ of the length, anterior extremity considerably more narrowed than the posterior. Cephalosome faintly defined from the 1st pedigerous segment, rostral ledge but slightly prominent. Lateral lobes of last segment of metasome somewhat produced and narrowly rounded, exhibiting at the tip a small nodiform projection. Urosome unusually slender, exceeding half the length of the anterior division, genital segment with the proximal part rather narrow, carrying 2 small juxtaposed tubercles below, genital protuberance very large and thick, proceeding from the hind part of the segment, and at right angles to it, tip blunted and exhibiting on each side a small projecting lobule. The 2 middle caudal segments of about equal size and minutely hairy. Caudal rami about the length of the last caudal segment, and obliquely oval in form, inner corner drawn out to a conical process carrying the appendicular bristle; the latter exceedingly slender, almost attaining the length of the whole body, and distinctly geniculate at the base; marginal setæ very densely plumous, the innermost but one considerably longer than the others, which are nearly equal in length. Anterior antennæ slightly exceeding in length the anterior division of the body, the proximal articulations finely hairy on the posterior edge.

Male exceedingly slender in form, with the cephalon and 1st pedigerous segment wholly coalesced, rostrum deflexed. Urosome narrow cylindric in form, and, as usual, 5-articulate, last segment, however, almost obsolete, hind edge of the 2 middle segments divided into delicate flattened denticles. Caudal rami more rounded than in female, and movably articulated to the last segment, appendicular

bristle comparatively short. Anterior antennæ somewhat thickened at the base, and only 22-articulate. Masticatory part both of the mandibles and maxillæ obsolete. Anterior maxillipeds extremely small and rudimentary. Posterior maxillipeds likewise much smaller than in female, spines of the terminal part transformed to flexible ciliated setæ. 1st pair of legs with the outer ramus distinctly 3-articulate. Last pair of legs considerably exceeding the urosome in length, left leg with the hand shorter than the preceding joint and slightly widening distally, with the inner edge coarsely dentate, thumb produced to a sharp unguiform point, dactylus short, with a brush of hairs inside the tip, appendicular lappet obtusely rounded.

Colour. Body pellucid, with the oral region more or less deeply tinged with crimson; ova in the ovisac dark blue. Caudal setæ with the cilia beautifully iridescent.

Length of adult female about 8 mm., of male 7 mm.

Remarks.—This form was first recorded by Boeck from the Norwegian coast, but at first erroneously identified with *E. Prestandreæ*, Philippi (= E. marina Prestandrea), which species does not occur in the northern Ocean. The form recorded by Moebius as *E. carinata,* is unquestionably identical with Boeck's species. On the other hand, the form described and figured by the present author, in his account of the Crustacea of the Norwegian North Atlantic Expedition, as *E. norvegica,* Boeck, is not that species, but a nearly allied form, *E. barbata,* Brady; and the form recorded from Nansen's Polar Expedition under the same name, has also, on a closer examination, turned out to be a different species, viz., *E. glacialis,* Hansen. Both these species are now proved to belong to the fauna of Norway, and will be described below. The present species is chiefly characterised by its unusually slender body, the form of the genital protuberance in the female, and the structure of the hand in the last left leg of the male.

Occurrence.—I have found this handsome Calanoid rather frequently along the whole Norwegian coast, from the Christiania Fjord to Vadsö, especially in the great depths of the fjords. At times, however, it also ascends nearer to the surface, and in the several proofs of plankton taken during the cruise of the "Michael Sars" in the open sea, it was by no means unfrequent. Male specimens are not infrequently found, and are at once recognized by their extremely slender body and the largely developed last pair of legs.

Distribution.—Occasional in two different places in the polar basin crossed by Nansen.

16. Euchæta glacialis, Hansen.

(Pl. XXVII).

Euchæta glacialis, Hansen. Oversigt over de paa Dijmphna-Togtet indsamlede Krebsdyr, p. 74, Pl. XXIII, figs. 5—5 K, Pl. XIV, figs. 1—1 d.

Syn: *Euchæta norvegica*, G. O. Sars (part).

Specific Characters.—Female. Very like the preceding species in its external appearance, though of larger size and somewhat more robust form of body. Cephalosome not defined from the 1st pedigerous segment by any perceptible demarcation, form of rostrum as in *E. norvegica.* Lateral lobes of last segment of metasome slightly angular, but without any tuberculiform projection at the tip. Urosome comparatively shorter, not nearly attaining half the length of the anterior division, genital protuberance issuing from about the middle of the segment, and broadly conical in form, extending somewhat obliquely behind, tip provided on each side with 2 narrowly rounded lobules. Outer caudal segments minutely hairy. Caudal rami comparatively shorter than in *E. norvegica* and less oblique, appendicular bristle not exceeding in length the marginal setæ, and slightly flexuous at the base, the innermost but one of the caudal setæ almost twice the length of the others. Structure of the several appendages almost exactly as in *E. norvegica.*

Male likewise closely resembling that of the said species, though perhaps somewhat less slender of form, and differing in the structure of the hand of the last left leg, the thumb of which has the form of an oblong quadrangular plate closely crenulated along the edges, and transversely truncated at the tip.

Colour more or less bright red.

Length of adult female about 10 mm., of male 8 mm.

Remarks.—This form was first described by Dr. Hansen in the above-quoted paper. I did not, however, at first recognise its specific difference from *E. norvegica,* and it was therefore, in my account of the Crustacea of Nansen's Polar Expedition, only quoted as a synonym to that species. The closer examination which I have recently instituted, however, has led to the result, that Dr. Hansen's species ought to be maintained, though it certainly comes very near to *E. norvegica.* The chief differences consist in the somewhat more robust form of the body, the more conical genital protuberance in the female, and the rather different structure of the thumb in the left last leg of the male. It also attains a considerably larger size, some of the specimens even exceeding 10 mm. in length.

Occurrence.—In the immediate neighbourhood of the Norwegian coast this form has not yet been met with. I have, however, recently found it in 3

of the plankton-samples taken during the cruise of the "Michael Sars" in 1900, two of which were from the Norwegian Sea, the one (St. 9) about midway between Iceland and Norway, the other farther north, at some distance east of Jan Mayen, the depth at the first-named Station being recorded to be from 200 to 400 metres, at the last-named from 500 to 1000 metres.

Distribution.—The Kara Sea (Hansen), Polar basin crossed by Nansen, rather abundant in many places, from 300 metres up to the very surface of the sea (the present author).

17. Euchæta barbata, Brady.

(Pl. XXVIII).

Euchæta barbata, Brady. Report on the Copepoda of the Challenger Expedition, p. 66, Pl. XXII, figs. 6—12.

Syn: *Euchæta norvegica,* G. O. Sars (part).

Specific Characters.—Female. General form of body closely resembling that of *E. glacialis.* Cephalosome wholly coalesced with the 1st pedigerous segment, rostrum as in the 2 preceding species; epistomal protuberance very densely hirsute. Lateral corners of last segment of metasome broadly rounded off and densely hairy below. Urosome not nearly attaining half the length of the anterior division, genital protuberance comparatively less prominent than in the 2 preceding species, and issuing from the anterior part of the segment, apical lobules very unequal, the anterior ones being much larger than the posterior and recurved in a beaklike manner. Outer caudal segments densely clothed with hairs, which, especially on the ventral face, are rather long and to some extent arranged in fascicles. Caudal rami comparatively short and likewise densely hairy on both edges; innermost but one of the caudal setæ almost twice as long as the others; appendicular bristle, as in *E. norvegica*, very much elongated, and distinctly geniculate at the base. Antennæ, oral parts, and legs scarcely differing in their structure from those parts in the 2 preceding species.

Male exhibiting the same differences from the female as in the 2 preceding species. Hand of left last leg, however, somewhat different, the thumb not being produced at the end, but coarsely denticulated along the inner edge, 2 of the denticles larger than the others, dactylus as in the 2 preceding species, appendicular lobe, however, narrower, cylindric in form and hamiformly curved at the tip.

Colour bright red.

Length of adult female reaching to 12 mm., of male to 10 mm.

Remarks.—It is with considerable hesitation that I refer this form to Brady's species. I cannot, however, in the rather imperfect description and figures given by that author, find any essential difference which would forbid such an identification. In its general appearance this form closely resembles *E. glacialis,* from which species it is, however, at once distinguished by the rather different form of the genital protuberance in the female, as also by the great length of the appendicular bristle of the caudal rami, in which latter respect it agrees with *E. norvegica.* The dense hispidity of the outer caudal segments in the female likewise furnishes an easily recognizable character. In the male the hand of the left last leg looks somewhat intermediate in structure between that of the last-named species and of *E. glacialis*, the thumb resembling in form that in *E. glacialis*, whereas its armature more closely agrees with that in *E. norvegica.* This form is perhaps the largest of all known Calanoids, its size even exceeding that of *E. glacialis.*

Occurrence.—Several well-preserved specimens of this magnificent form were found in the above-mentioned plankton-sample from St. 34 of the cruise of the "Michael Sars". A single specimen, moreover, occurred in another plankton-sample taken at Stat. 46, at some distance west of the Lofoten Islands. The same species was also procured during the Norwegian North Atlantic Expedition by the aid of the trawl in several places in the Norwegian Sea, and always in great depths, down to 2000 fathoms. The figures given in my account of the Crustacea of that Expedition refer to this species, and not to *E. norvegica.* In the Polar basin crossed by Nansen, this form did not occur.

Distribution.—South Atlantic Ocean in lat. 36° 44′ S., long. 46° 16′ W., depth 2650 fathoms (Brady).

Fam. 7. Phaënnidæ.

Syn: *Scolecithricinæ,* Giesbrecht (part).

Characters.—Form of body, as a rule, rather robust, with the anterior division more or less tumefied. Cephalosome coalesced with the 1st pedigerous segment or imperfectly defined from it; frontal part rounded, rostral prominence with or without tentacular appendages. Last segment of metasome more generally defined from the preceding one. Urosome comparatively short, with the genital segment in female not very protuberant below, last segment small. Eye

generally double. Anterior antennæ in female of moderate length or comparatively short, 23- or 24-articulate; those of male with the usual supply of sensory appendages, and having some of the articulations confluent. Posterior antennæ with the outer ramus generally longer than the inner, and 6-articulate. Oral parts on the whole normal, except the anterior maxillipeds, which are rather short and clearly characterised by the peculiar transformation of the setæ of the terminal part into extremely delicate, incurved cylindric appendages terminating in a brush of fine ciliæ. Natatory legs strongly built, and of a structure similar to that in the *Ætideidæ*. 5th pair of legs in female generally present, though rather small, triarticulate, not natatory; those in male comparatively simple, left leg the longer.

Remarks.—This new family is established to comprise some genera referred by Dr. Giesbrecht to his subfamily *Scolecithricinæ,* for which the genus *Scolecithrix* of Brady is the type. As, however, the species referred to the latter genus in reality belong to several distinct genera, I have felt justified in comprising those genera in a separate family, *Scolecithricidæ*, to be treated of farther on. The chief character of the present family consists in the peculiar transformation of the setæ of the terminal part of the anterior maxillipeds to extremely delicate penicillate appendages, not found in any of the preceding families. In other respects, the forms belonging to this family recall, both in their external appearance and in several of the structural details, that of the *Ætideidæ*. Whereas, however, in the latter family the 5th pair of legs are always wanting in the female, these legs are generally present, though in a rudimentary state, in the *Phaënnidæ*. We know at present of 3 distinct genera belonging to this family, viz., *Phaënna*, Claus, *Pseudophaënna,* G. O. Sars, and *Xanthocalanus,* Giesbrecht. Of these the 2 last-mentioned are represented in the fauna of Norway.

Gen. 11. **Pseudophaënna,** G. O. Sars, n.

Generic Characters.—Body comparatively short and stout, with the anterior division considerably tumefied. Cephalosome completely coalesced with the 1st pedigerous segment, frontal part rounded and projecting below in an undivided rostrum, obtuse at the tip. Last segment of metasome very small, but distinctly defined from the preceding one, lateral lobes but slightly produced. Urosome in female comparatively short, 4-articulate, in male more slender, last segment in both sexes rather small. Caudal rami short, obtusely rounded at the tip, apical setæ rather elongated, appendicular bristle small. Eye consisting of two closely

approximate halves. Anterior antennæ comparatively short and rather densely setiferous, consisting in female of 23 articulations. Posterior antennæ with the outer ramus very large, inner poorly developed, with the apical setæ much reduced in number. Mandibles well developed, with the teeth of the masticatory part strong and partly bidentate. Exopodite of maxillæ very small, bisetose. Anterior maxillipeds with all the spines of the basal part of the same structure though of different length, and very flexible. Posterior maxillipeds rather powerful, with the 2nd basal joint fusiformly dilated, terminal part comparatively short. Oral parts in male considerably reduced. Natatory legs strongly built, inner ramus with no spinules on the hind face. 5th pair of legs in female very small, with the terminal joint simple, digitiform; those in male with both legs well developed.

Remarks.—This new genus is somewhat intermediate between *Phaënna* and *Xanthocalanus,* agreeing with the former in the robust form of the body, with the latter in the presence in the female of distinct, though very small legs of 5th pair. From both these genera it differs very markedly in several of the structural details, though in the peculiar transformation of the apical setæ of the anterior maxillipeds it exactly agrees with both of them. The genus at present only contains a single species, to be described below.

18. Pseudophaënna typica, G. O. Sars, n. sp.

(Pl. XXIX, XXX).

Specific Characters.—Female. Anterior division of body, seen dorsally, regularly oval or elliptical in outline, greatest width about equalling half the length, anterior extremity narrowly rounded, posterior somewhat contracted. Cephalosome with the dorsal margin forming a quite even curve up to the tip of the rostrum; the latter conical in form and pointing straight downwards. Last segment of metasome very small, with the lateral lobes narrowly rounded. Urosome scarcely attaining $^1/_3$ of the length of the anterior division, genital segment about the length of the 2 middle segments combined. Caudal rami a little longer than they are broad, and scarcely at all divergent, innermost but one of the apical setæ longer than the others. Anterior antennæ scarcely longer than the anterior division of the body, and rather densely setous, all the articulations sharply defined. Posterior antennæ with the outer ramus more than twice as long as the inner, terminal joint of the latter with only 3 or 4 setæ on each of the lobules. Posterior maxillipeds with the 2nd basal joint almost twice as long as the 1st, and considerably dilated in the middle, terminal part scarcely half as long, and more or less incurved, with the 2 outer joints very small, procurved setæ of the preceding ones very

strong, spiniform. Last pair of legs extremely small, though distinctly 3-articulate, basal joint rather thick and armed at the end inside with densely crowded spinules, last 2 joints unarmed, middle one very short, terminal joint straight, digitiform.

Male not differing much from female in its external appearance, though having the urosome considerably more slender, and, as usual, 5-articulate. Anterior antennæ consisting of only 21 articulations. Both pairs of maxillipeds considerably transformed, the anterior ones very small, the posterior ones with the terminal part reflexed. Last pair of legs very slender, right leg 5-articulate and reaching beyond the antepenultimate joint of left.

Colour dark yellowish brown.

Length of adult female 1.60 mm., of male 1.40 mm.

Remarks.—In its general appearance this Calanoid somewhat recalls the *Ætideid* described above as *Bryaxis brevicornis*, Boeck, having a similar robust form of body and also comparatively short and densely setous anterior antennæ. On a closer examination, however, it is found to differ very essentially, so that it cannot even be included in the same family. It also somewhat resembles the Mediterranean form, *Phaënna spinifera,* Claus; but this Calanoid has the body still more robust, whereas its anterior antennæ are considerable more slender.

Occurrence.—I have found this peculiar Calanoid occasionally in several places on the Norwegian coast, from the Christiania Fjord to Vardö, and always, like the species of the genus *Undinopsis,* only close to the ground in depths ranging from 20 to 50 fathoms. It accordingly is a true bottom-form, unlike what is generally the case with the Calanoida. Out of Norway this form has not yet been found.

Gen. 12. **Xanthocalanus,** Giesbrecht, 1892.

Generic Characters.—Body less robust than in the preceding genus, with the cephalosome more or less distinctly defined from the 1st pedigerous segment, rostral prominence with 2 soft posteriorly-pointing tentacular appendages. Lateral lobes of last segment of metasome produced to more or less prominent acute lappets. Urosome short, of a structure similar to that in the preceding genus. Two eyes present, separated by a distinct interspace. Anterior antennæ in female rather slender, 24-articulate, bristles of anterior edge not very strong, 2 of them issuing from the basal joint finely plumose; those of male richly supplied with sensory appendages, and having some of the articulations coalesced. Posterior

antennæ with the inner ramus well developed, though somewhat shorter than the outer. Mandibles comparatively narrow, with the teeth of the masticatory part simple. Maxillæ normal. Anterior maxillipeds with each of the 2 outer digitiform lobes carrying a strong, claw-like spine, coarsely denticulate inside. Posterior maxillipeds rather slender. Inner ramus of 2nd to 4th pairs of legs armed on the hind face with oblique rows of rather strong spinules. Last pair of legs in female with the terminal joint spiniferous; those of male comparatively simple, left leg very slender, right rudimentary or wanting.

Remarks.—This genus was established in the year 1892 by Dr. Giesbrecht, to comprise 2 supposed species from the Mediterranean, viz., *X. agilis* and *minor*. In my opinion, however, the latter species ought to be discarded, being apparently only founded upon immature specimens of the former. The genus is easily distinguished both from *Phaënna* and *Pseudophaënna* by the less robust form of body, the structure of the rostral part, and the acutely produced lateral lobes of the last segment of the metasome. Moreover, the 2 strong and coarsely dentate spines on the anterior maxillipeds are rather characteristic, as also the structure of the last pair of legs in both sexes. Two well-defined, though closely allied species, to be described below, belong to the fauna of Norway.

19. Xanthocalanus borealis, G. O. Sars.

(Pl. XXXI, XXXII).

Xanthocalanus borealis, G. O. Sars. Crustacea of the Norwegian North Polar Expedition, p. 49, Pl. XI.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong oval in form, greatest width not attaining half the length, anterior extremity narrowly rounded, posterior slightly contracted. Cephalosome evenly vaulted above, and defined from the 1st pedigerous segment by a faint curved suture. Last segment of metasome completely coalesced with the preceding one, lateral lobes drawn out to acute, posteriorly-pointing lappets reaching in adult specimens beyond the middle of the genital segment. Urosome scarcely exceeding $^1/_4$ of the length of the anterior division, genital segment fully as long as the 2 succeeding ones combined. Caudal rami very short, scarcely longer than they are broad, apical setæ much elongated, especially the innermost but one, and somewhat divergent. Anterior antennæ very slender, when reflexed reaching about to the end of the genital segment. Posterior antennæ with the outer ramus but slightly exceeding the inner in length. Spinules on the hind face of the inner ramus in 2nd and 3rd pairs of legs regularly disposed in a single oblique row, those in 4th pair

more irregularly arranged, and wanting on the last joint. 5th pair of legs somewhat curved, with the inner edge of the basal joint densely spinulose, 2nd joint conspicuously dilated in the middle, almost globose, and slightly spinulose inside, terminal joint about the same length but much narrower, and armed in mature specimens with 4 short ciliated spines, 2 apical and 2 lateral. These legs in younger specimens of rather different appearance, the 2 outer joints being confluent to an angularly curved piece carrying only 3 spines on the tip.

Male considerably smaller than female and of more slender form, with the lateral lobes of last segment of metasome less prominent. Urosome very narrow, and comparatively longer than in female, caudal rami mobile. Anterior antennæ modified in the usual manner. Oral parts less rudimentary than in most other *Amphascandria*. Left leg of last pair exceedingly slender, with the 4th joint very narrow, linear, and longer than the last 2 joints combined; right leg distinctly developed, though very small, reaching about to the end of the 2nd joint of the left.

Colour. Body in both sexes whitish, pellucid, tinged in some places with a slight reddish pigment.

Length of adult female 3.50 mm., of male 2.50 mm.

Remarks.—This form was first described by the present author from a somewhat defective female specimen procured during Nansen's Polar Expedition. The apparent differences in the general form of the body, and especially in the structure of the last pair of legs, between the polar specimen and the Norwegian form here described, may be accounted for by the circumstance that that specimen was not fully mature, though of rather large size. I have found similar differences in young specimens of the Norwegian form. The present species is easily distinguished from the type species, *X. agilis,* Giesbrecht, both by its much larger size and by several other characters, for instance, the presence in the male of a right leg in the last pair.

Occurrence.—I have found this form not infrequently in the Stavanger Fjord, at Jelsö and Sunde, as also in a few other places off the west coast of Norway. The specimens were only procured by the aid of the dredge from very considerable depths, down to 400 fathoms, where it occurred together with *Chiridius armatus,* Boeck. The character of this Calanoid as a relict arctic form has been proved by the occurrence of a specimen of apparently the same species in the Polar Sea, at a far less depth.

Distribution.—Polar basin, north of the New Siberian Isles (a solitary young female specimen).

20. Xanthocalanus propinqvus, G. O. Sars, n. sp.

(Pl. XXXIII).

Specific Characters.—Female. Form of body resembling that of the preceding species, though somewhat less slender. Last segment of metasome defined from the preceding one by a distinctly marked suture, lateral lappets comparatively shorter than in *X. borealis*, scarcely reaching to the middle of the genital segment. Urosome about $^1/_3$ as long as the anterior division of the body; caudal rami longer than they are broad. Anterior antennæ very slender, reaching when reflexed, to the end of the 2nd caudal segment. Posterior antennæ with the outer ramus considerably longer than the inner. Oral parts almost exactly as in the preceeding species. Natatory legs likewise of a very similar structure, except that the spinules on the inner ramus of the 4th pair are arranged in a single oblique row. Last pair of legs comparatively shorter and more robust, basal joint coarsely spinulose inside, 2nd joint of about same breadth throughout, last joint much shorter and rather broad at the base, carrying an oblique row of 4 spines, the innermost of which is much coarser than the others.

Male resembling that of the preceding species, though somewhat differing in the structure of the last pair of legs, which are very asymmetrical, the right leg being extremely reduced in size, scarcely even reaching to the middle of the 1st joint of the left one.

Colour whitish, pellucid, without any conspicuous pigment.

Length of adult female 1.75 mm.

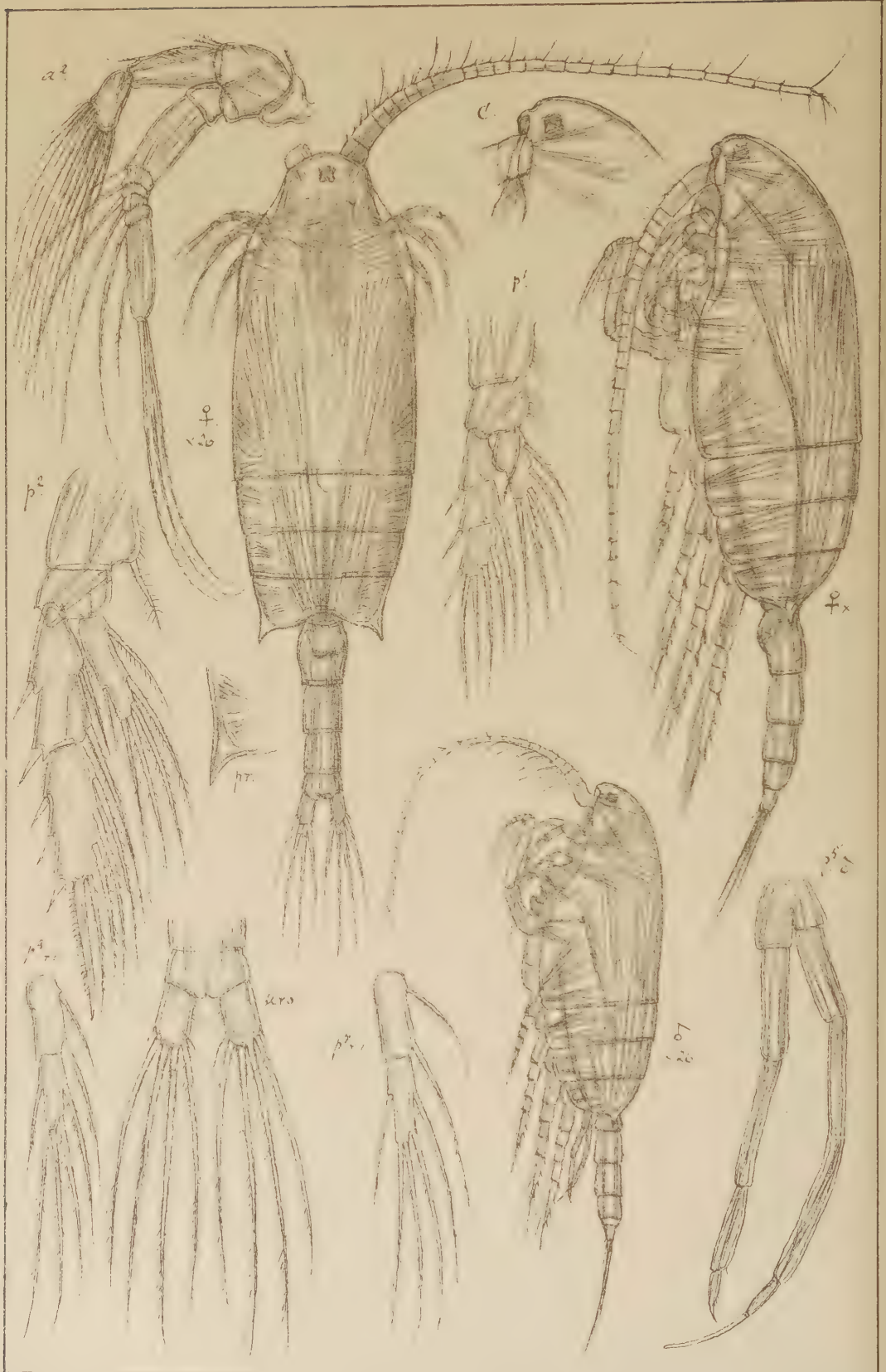
Remarks.—This form is closely allied to the preceding species, but of much smaller size, and somewhat less slender of form. It may, moreover, be easily distinguished by the well-marked separation of the last segment of the metasome from the preceding one, as also by the somewhat different structure of the last pair of legs in both sexes.

Occurrence.—Several specimens of this form were collected many years ago by the present author at Selsövig on the Nordland coast, located just within the Polar circle. They were procured by the aid of the dredge from a depth of about 100 fathoms. This species also occurs occasionally off the west coast of Norway, some few specimens having recently been found among those of *X. borealis* collected in this region.

Copepoda

Calanoida.

Ætideidæ. Pl. XVII.

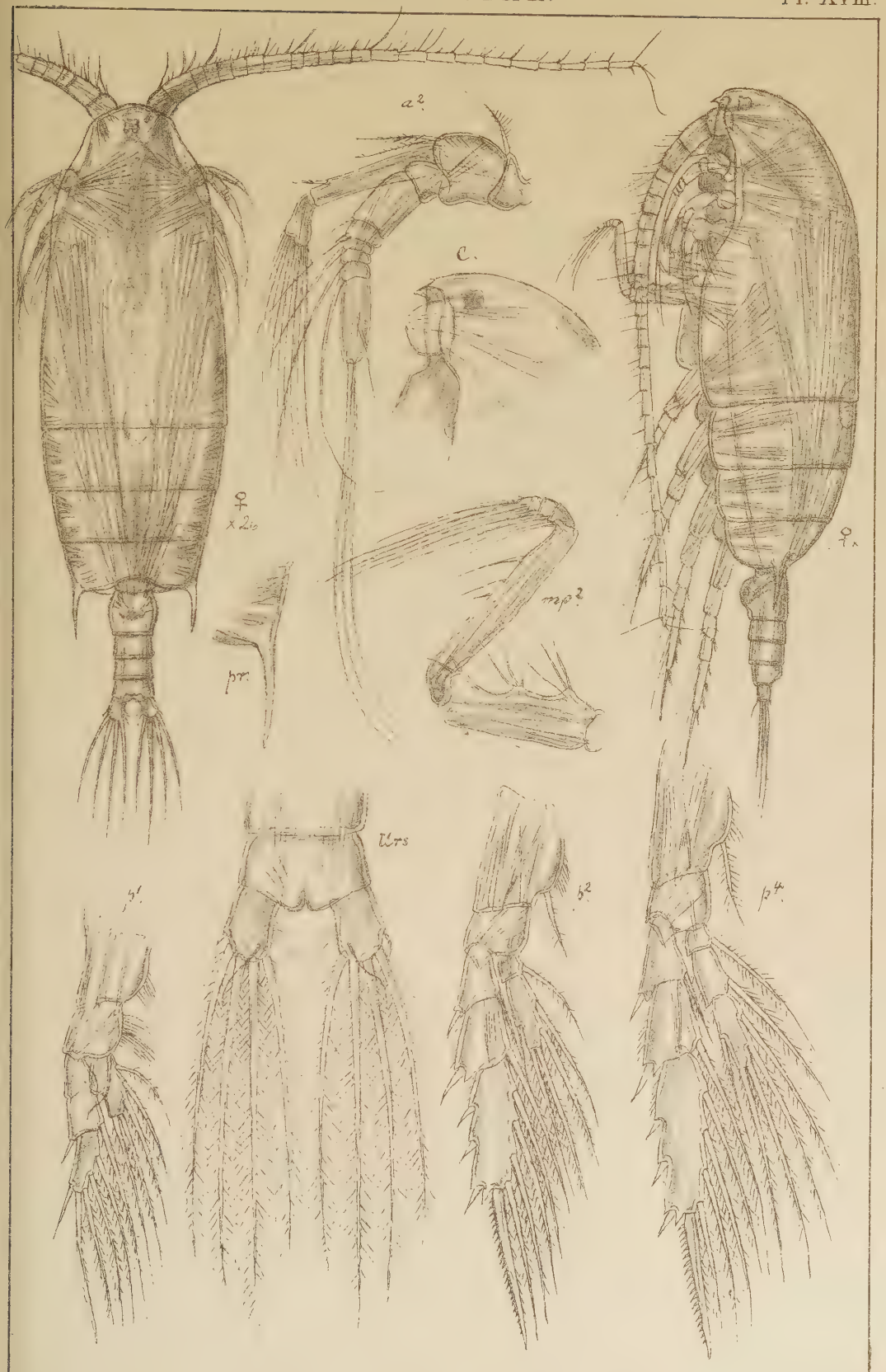


G.O. Sars autogr.

Chiridius obtusifrons, G. O. Sars.

Trykt i den private Opmaaling, Chra.

Copepoda
Calanoida.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Chiridius tenuispinus, G. O. Sars.

Copepoda
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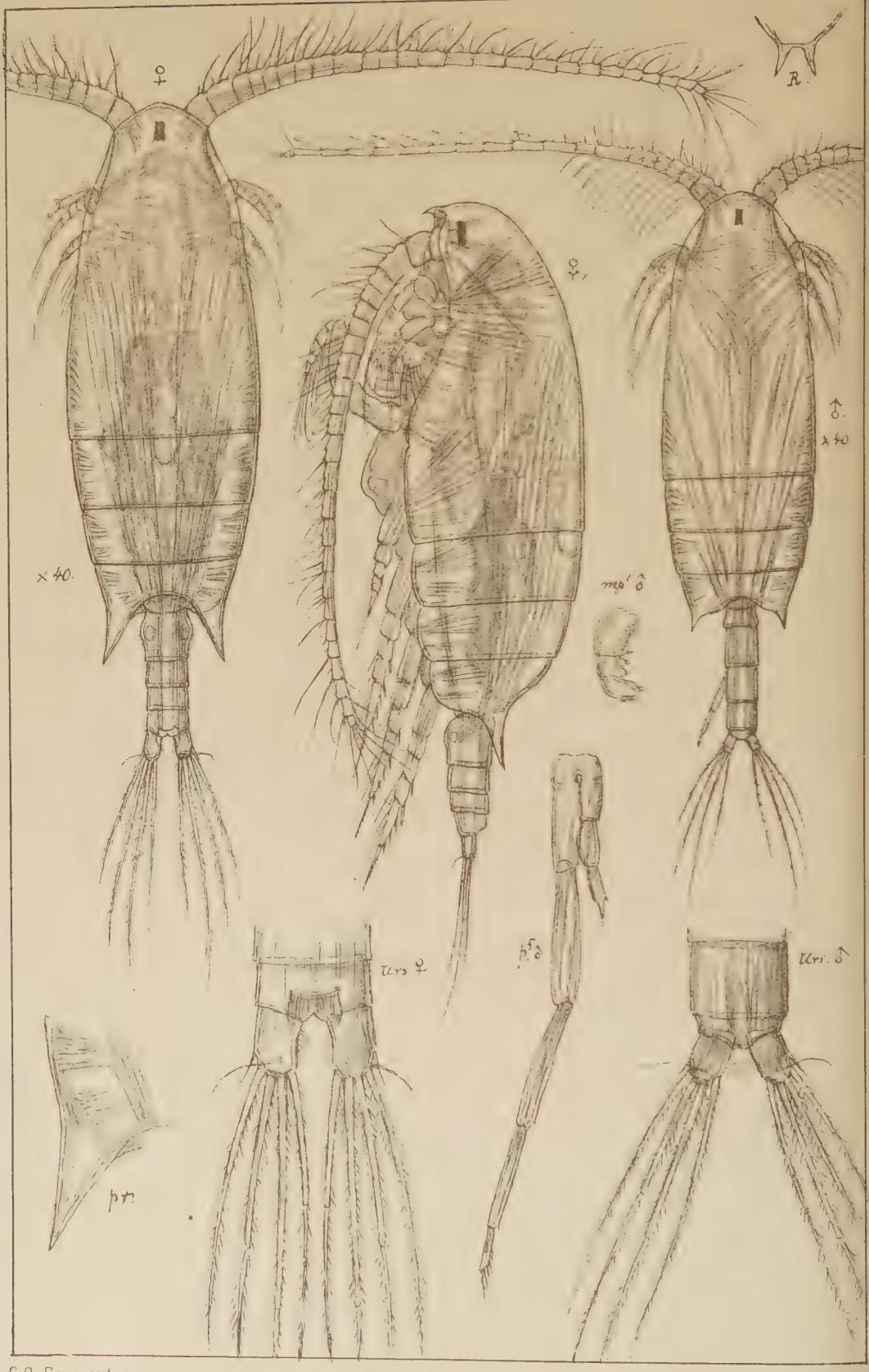
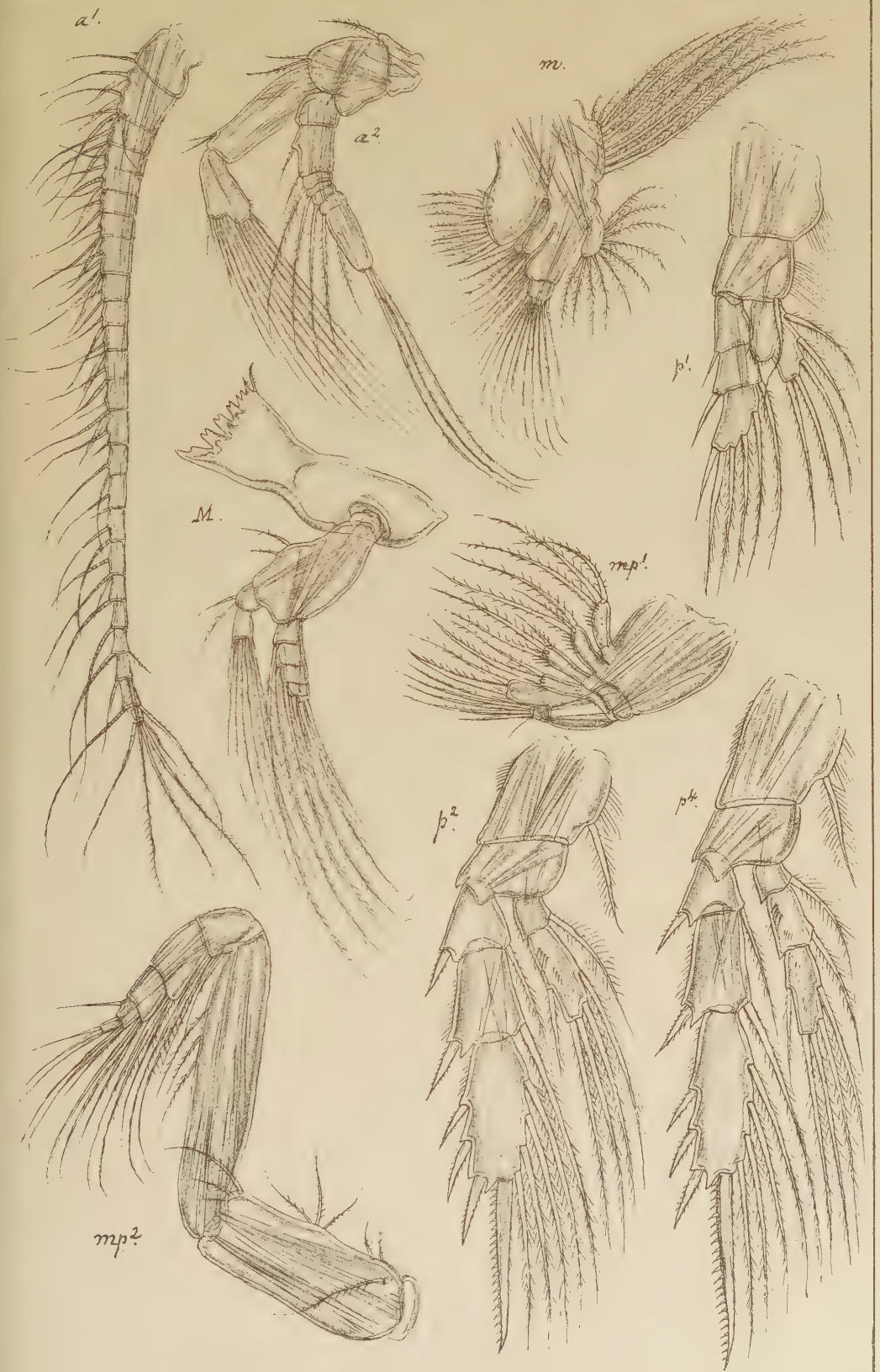


G.O. Sars autogr

Undinopsis Bradyi, G. O. Sars.

Trykt i den private Opmaaling, Chr

Copepoda
Calanoida.



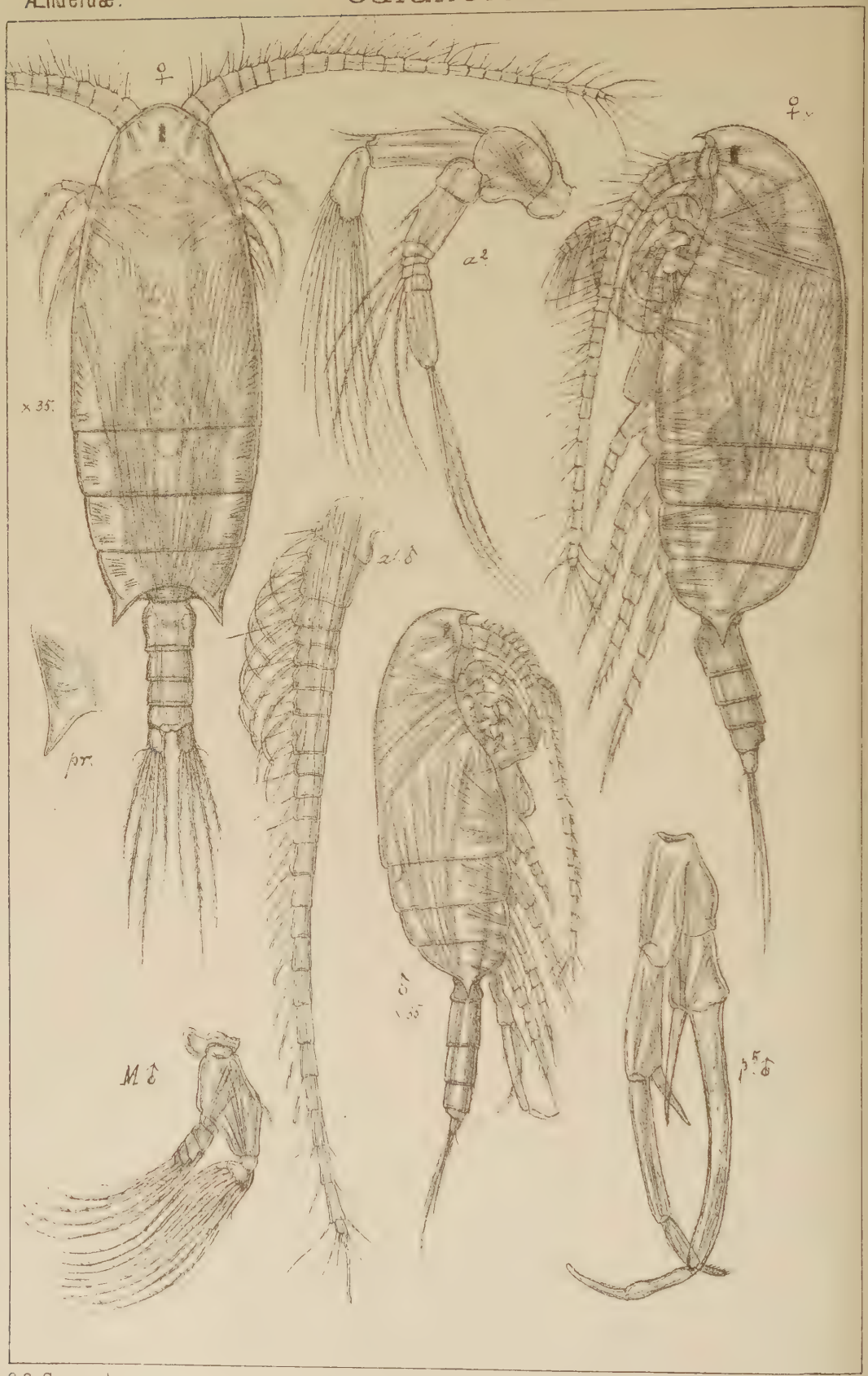
G.O. Sars autogr.

Undinopsis Bradyi, G. O. Sars.
(continued.)

Trykt i den private Opmaaling, Chra

Copepoda

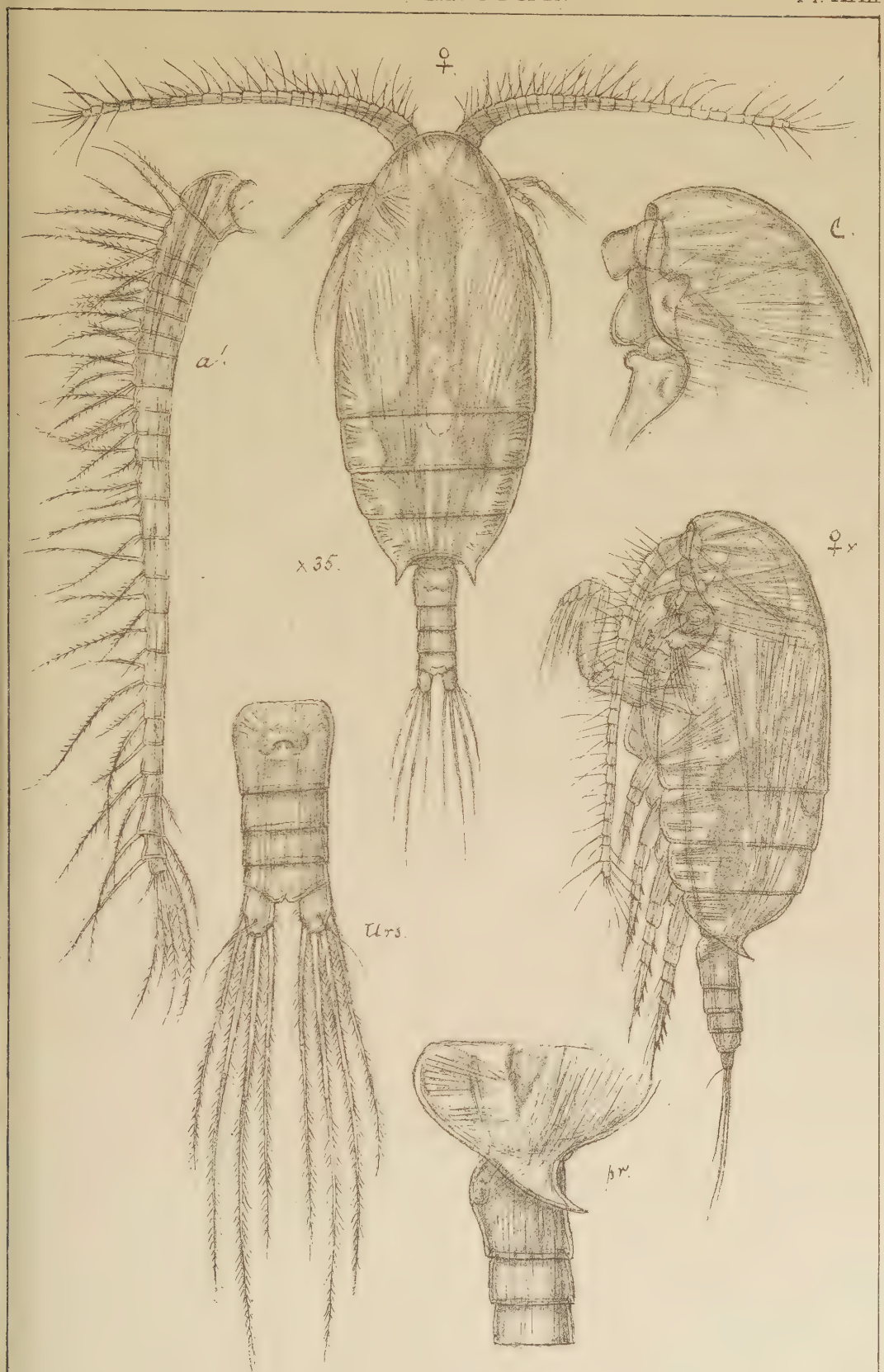
Calanoida.



G.O. Sars autogr

Undinopsis similis, G. O. Sars.

Trykt i den private Opmaaling, Chr

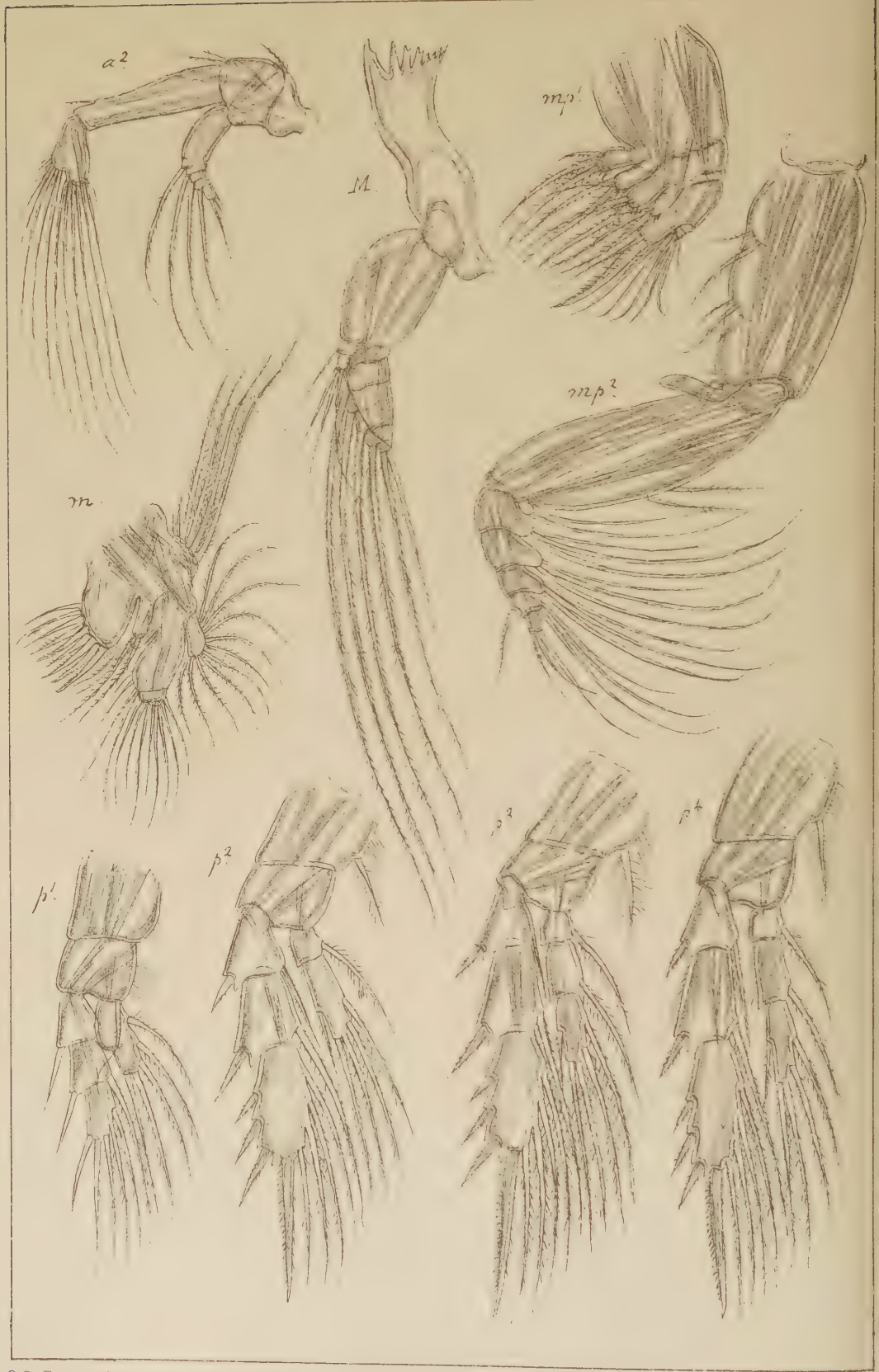


G.O. Sars autogr.

Bryaxis brevicornis, Boeck

Trykt i den private Opmaaling, Chra

Copepoda
Calanoida.

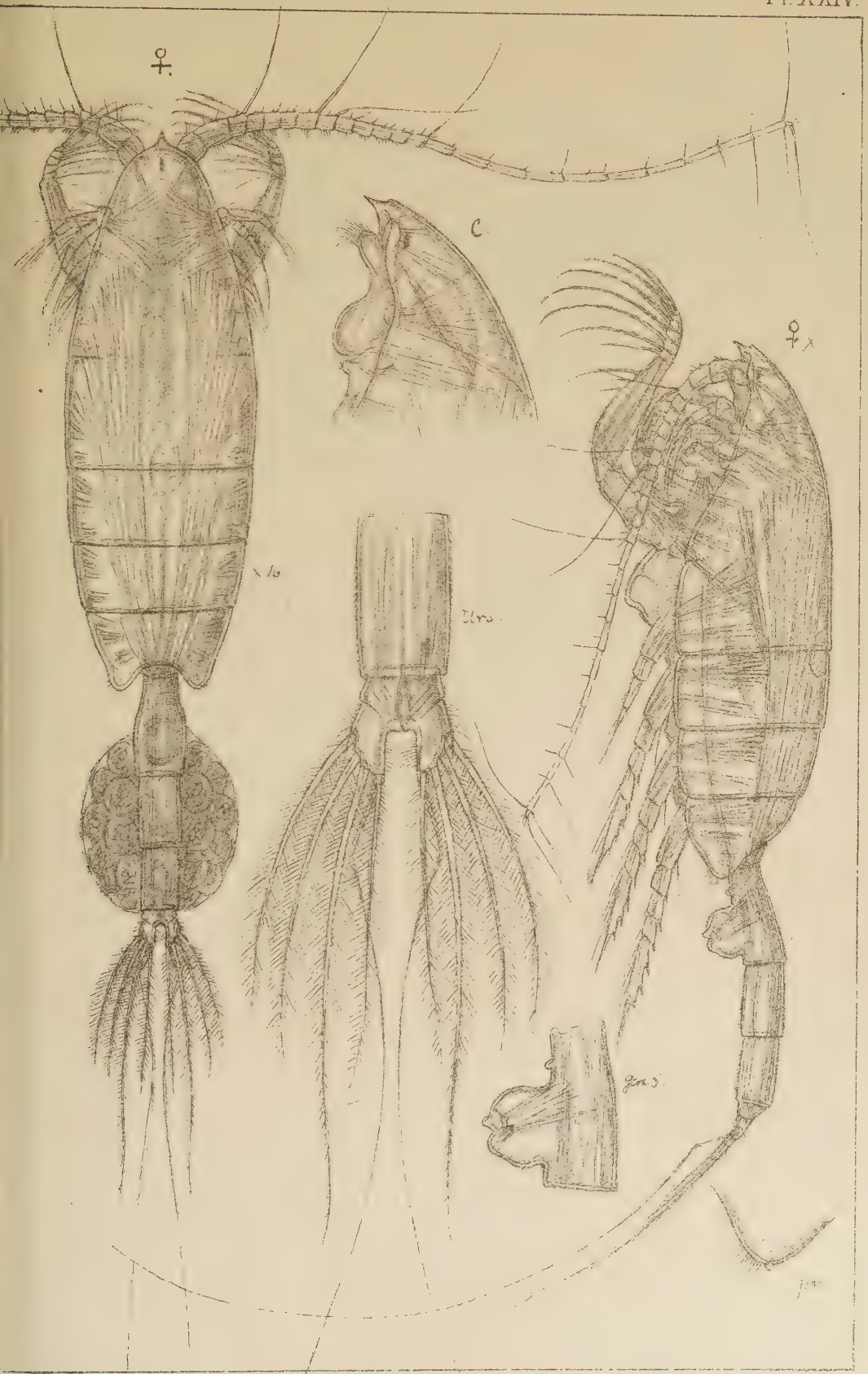


G.O. Sars autogr.

Trykt i den private Opmaaling, Chr

Bryaxis brevicornis, Boeck.
(continued.)

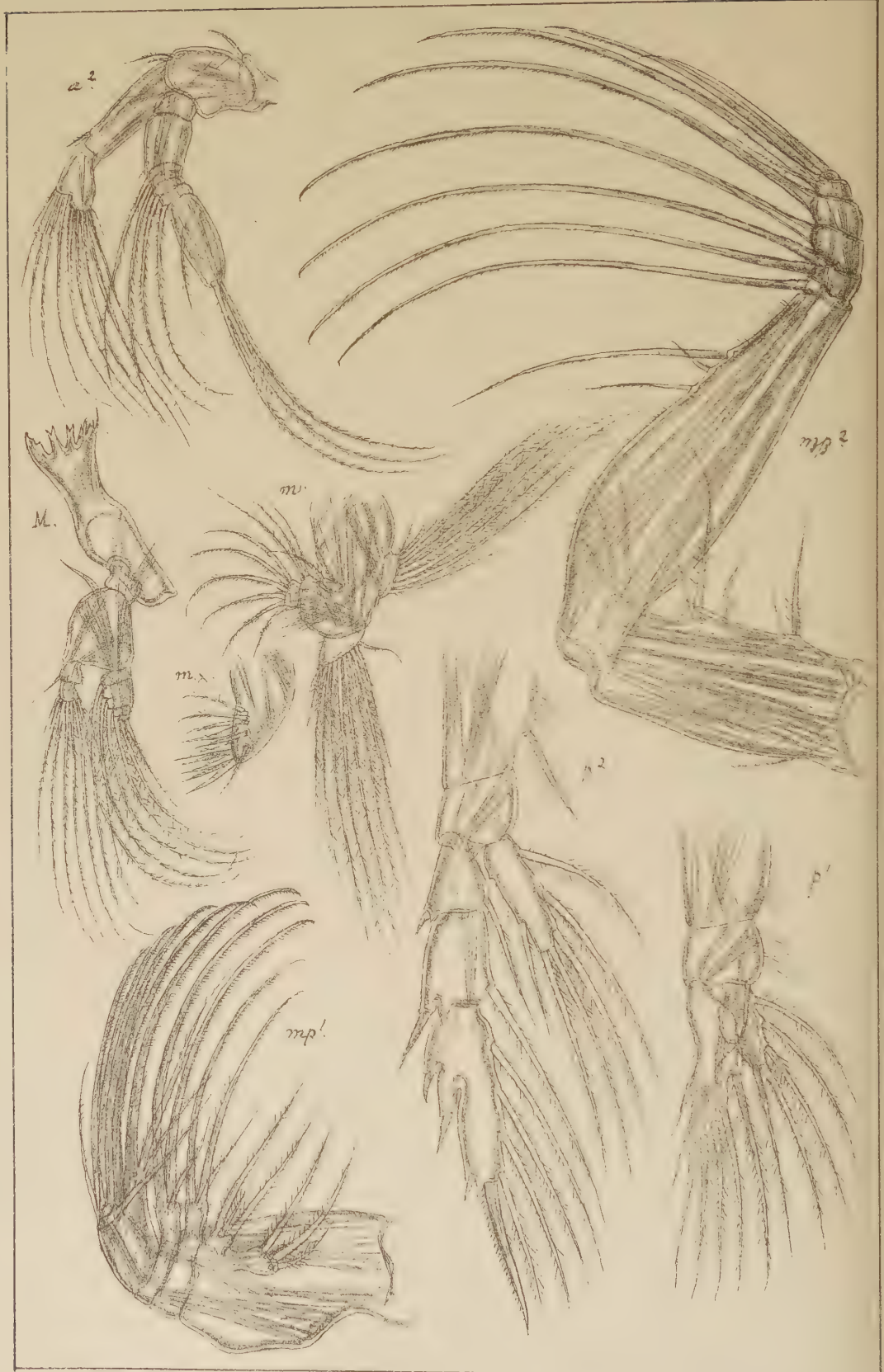
Copepoda
Calanoida.



G. Sars autogr.

Euchæta norvegica, Boeck

Trykt i den private Opmaaling, Chra



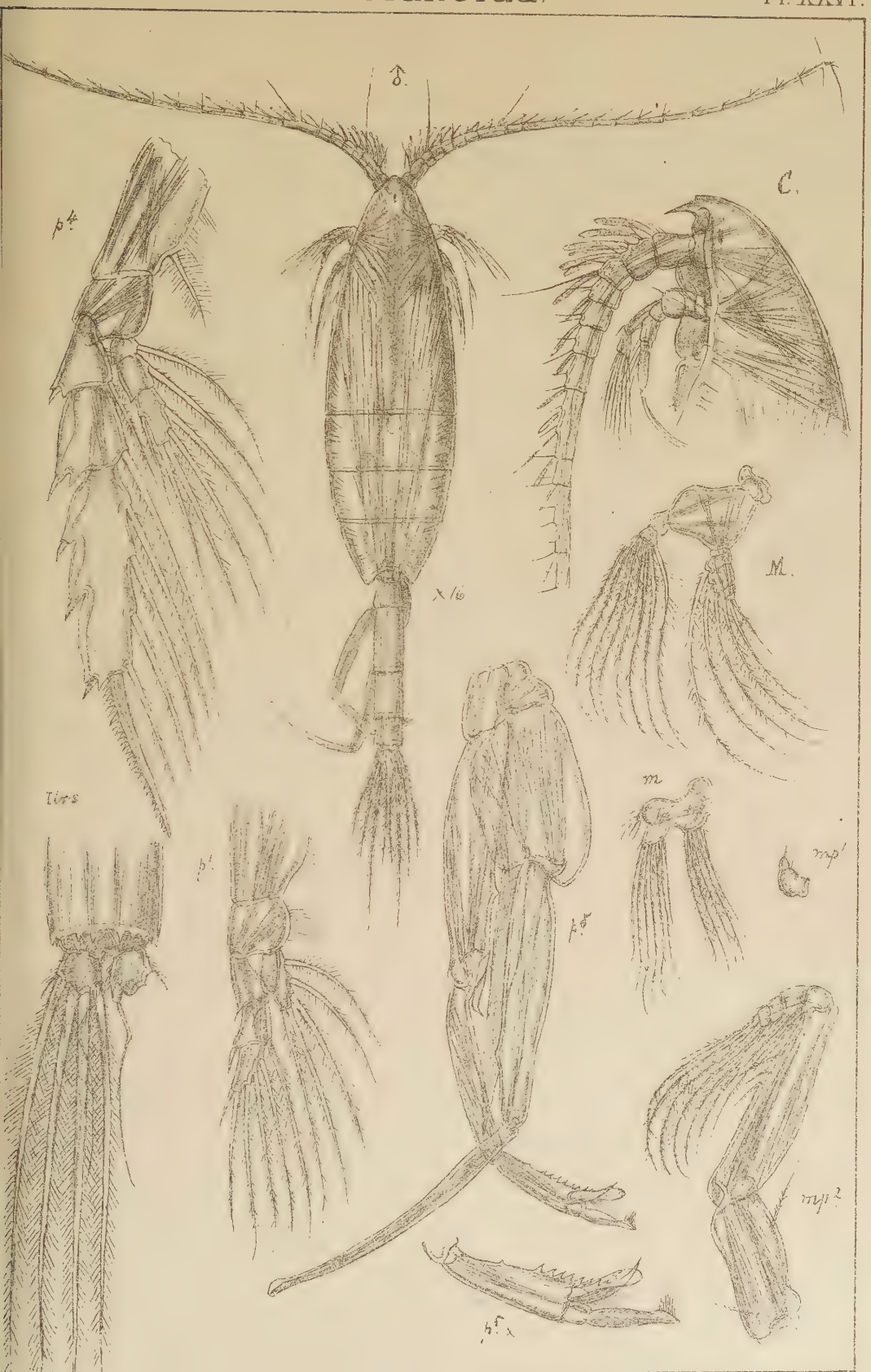
G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Euchæta norvegica, Boeck.
(continued.)

Copepoda.

Calanoida.

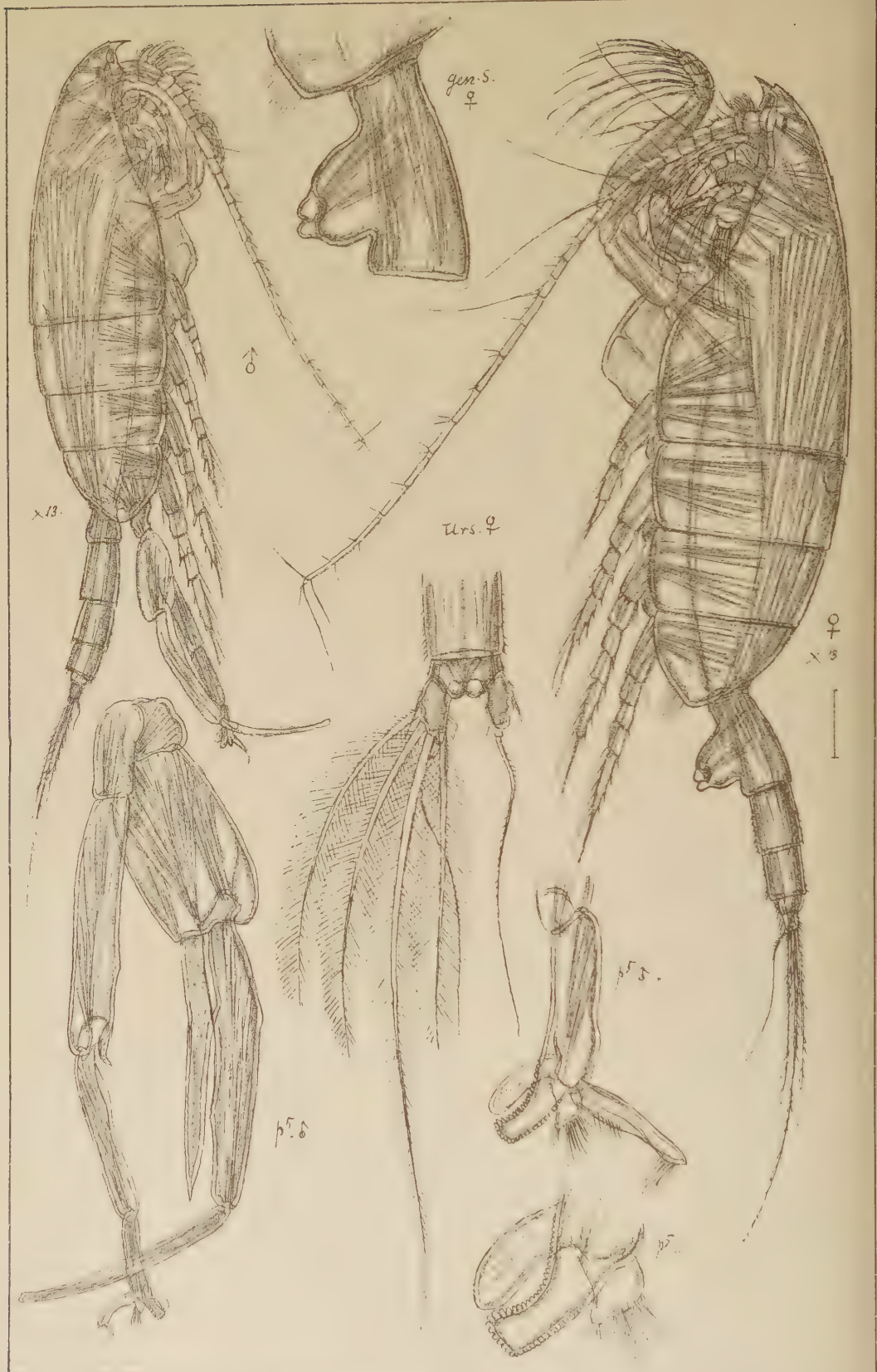


G. O. Sars autogr.

Trykt i den private Opmaaling Chra

Euchæta norvegica, Boeck
(male.)

Copepoda
Calanoida.

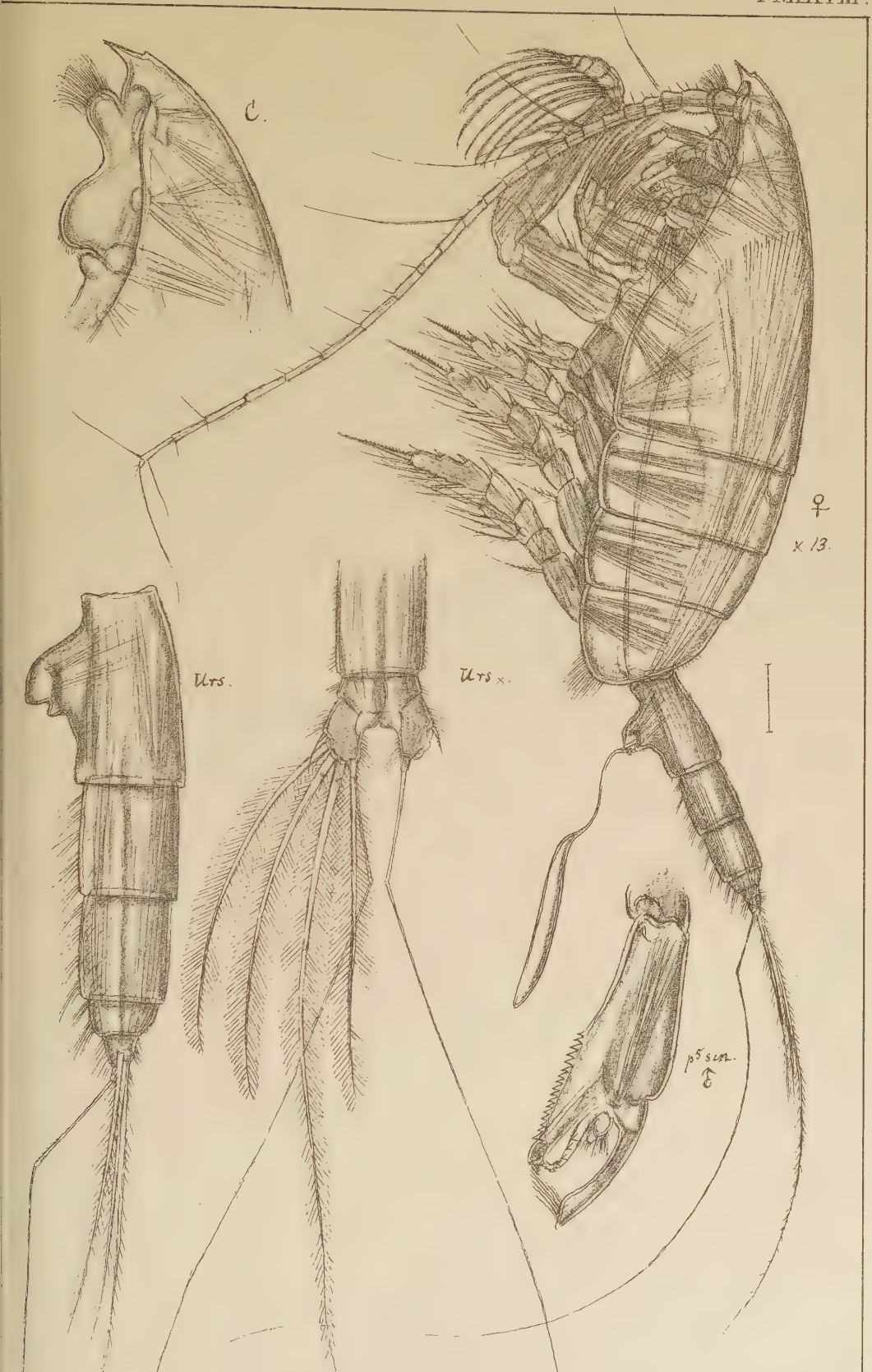


G O Sars autogr

Trykt i den private Opmaaling, Chr

Euchæta glacialis, Hansen

Copepoda
Calanoida.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

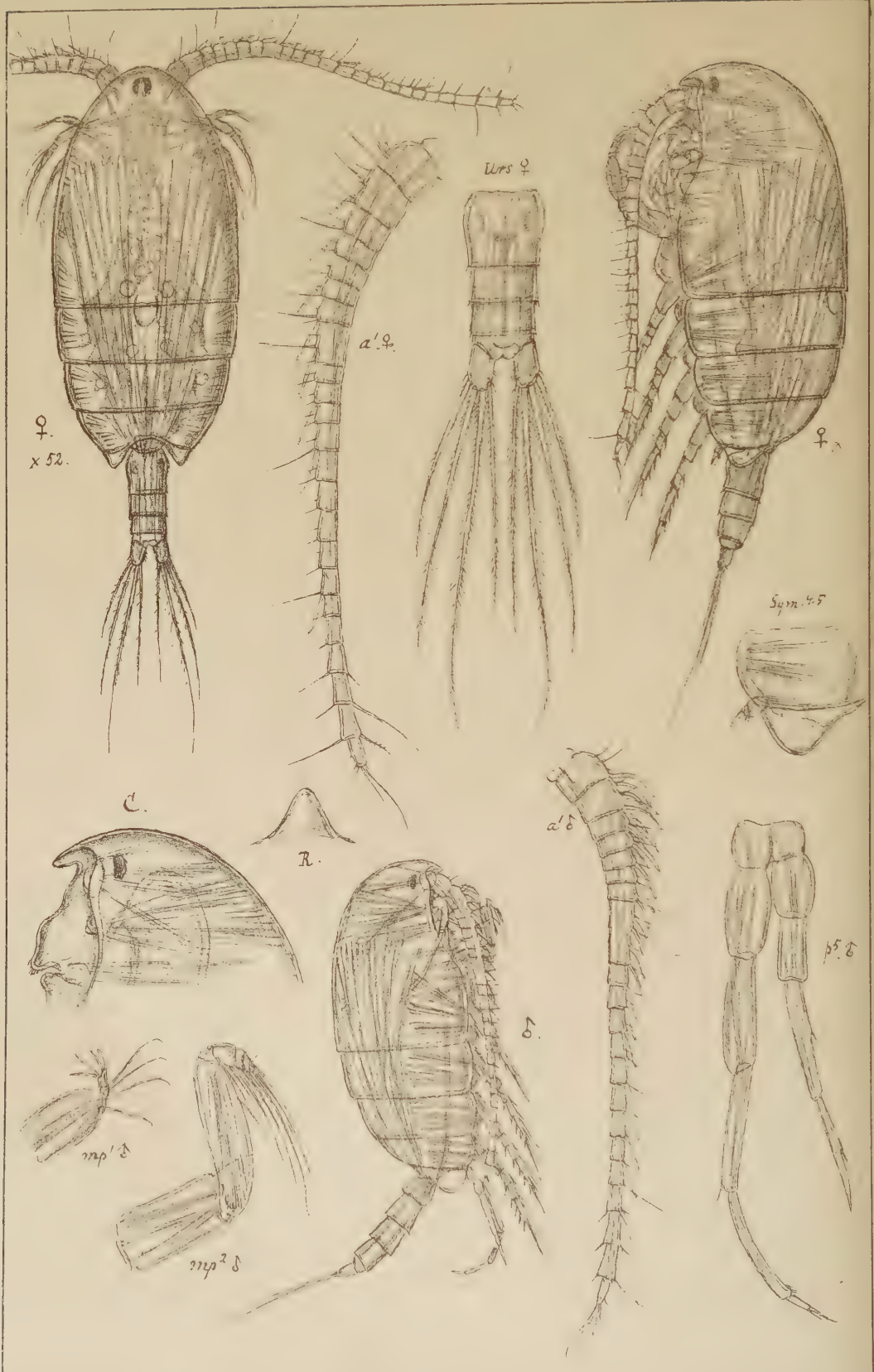
Euchæta barbata, Brady.

Copepoda

Calanoida.

Phaënnidæ

Pl. XXIX.

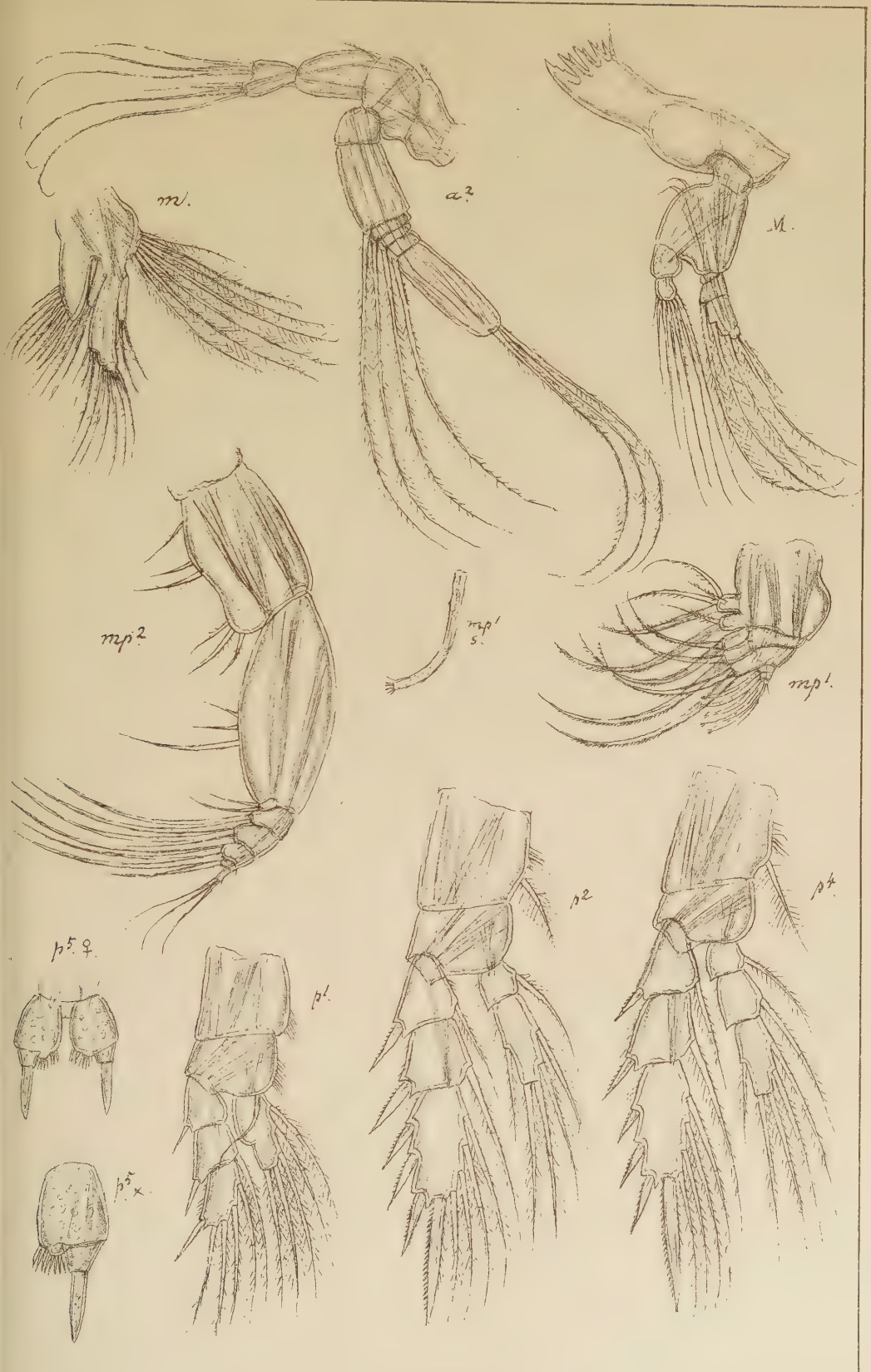


G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Pseudophaënna typica, G.O.Sars.

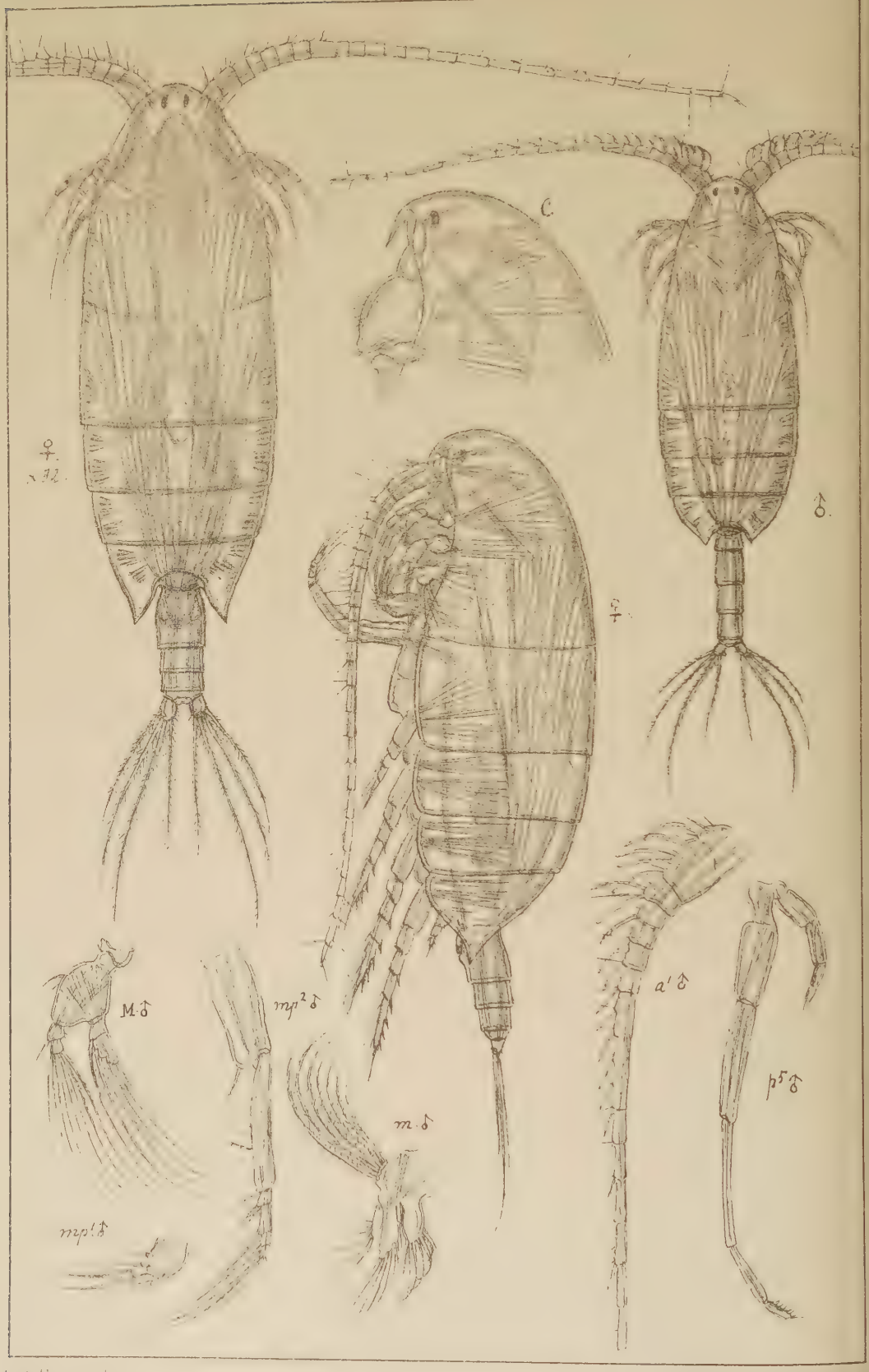
Copepoda
Calanoida.



G. Sars autogr.

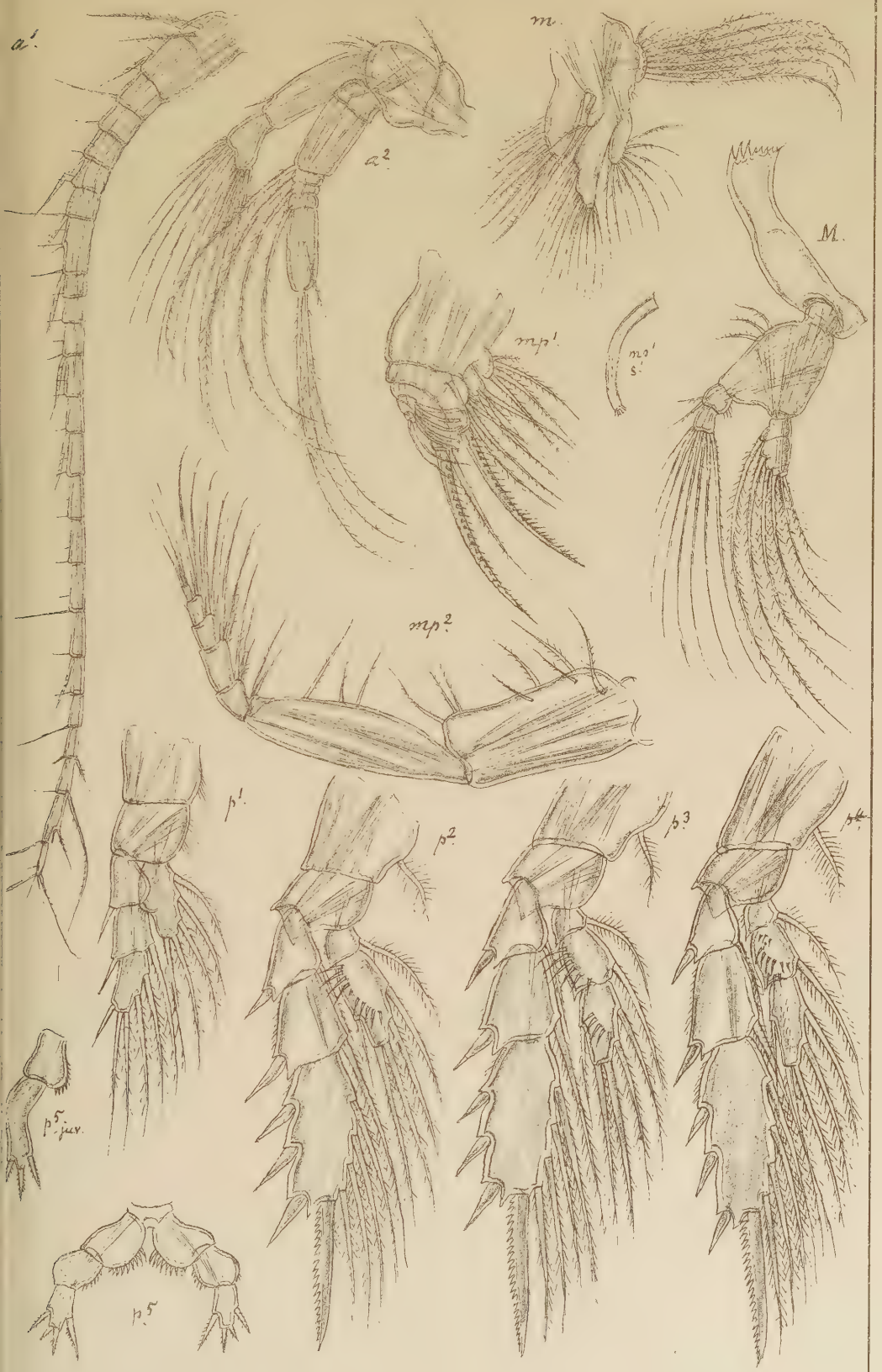
Trykt i den private Opmaaling Chra

Pseudophaënna typica, G. O. Sars.
(continued.)



G. O. Sars autogr.
Akt. den private Opmaaling Cop.

Xanthocalanus borealis, G. O. Sars.



Sars autogr.

Trykt i den private Opmaaling, Chra

Xanthocalanus borealis, G.O.Sars.
(continued.)

Fam. 8. Scolecithricidæ.

Characters.—Body of somewhat varying form, sometimes rather short and robust, sometimes more slender. Cephalosome coalesced with the 1st pedigerous segment, front carrying below 2 more or less distinct soft tentacular appendages. Last 2 segments of metasome generally united. Urosome, as a rule, short, 4-articulate in female, 5-articulate in male. Caudal rami short, with only 4 apical setæ. Eye small, simple. Anterior antennæ more or less slender, 19—23-articulate, with the outer 2 joints not distinctly defined; those in male transformed in the usual manner. Posterior antennæ with the outer ramus 6-articulate. Masticatory part of mandibles and maxillæ not very strong. Anterior maxillipeds comparatively small, with the setæ of the terminal part transformed to delicate sensory appendages, which are either all vermiform or some of them pedicellate, terminating in a knob-like dilatation. Posterior maxillipeds slender, with the terminal part reflexed. Oral parts in male more or less transformed. Natatory legs powerfully developed, and generally spinulous on the hind face, inner ramus of 1st pair uniarticulate, of 2nd pair biarticulate, of 3rd and 4th pairs 3-articulate. 5th pair of legs sometimes wanting in female, but more frequently present, though of rather simple structure; those in male comparatively slender and rather asymmetrical.

Remarks.—In this family I propose to comprise the several forms referred by other authors to the genus *Scolecithrix* of Brady. There cannot, in my opinion, be any doubt that some at least of these forms ought to be generically separated from each other, as they differ in several very essential characters, e. g. in the presence or absence of the last pair of legs in the female, and in the structure of these legs in the male. Another character has been called attention to by Mr. Th. Scott, viz., the different development of the terminal appendages to the anterior maxillipeds. I think we must admit at least 4 different genera, viz., *Scolecithrix*, Brady; *Lophothrix*, Giesbrecht; *Amallophora*, Scott, and *Scolecithricella*, G. O. Sars. Of these genera, only the 2 last-mentioned are represented in the fauna of Norway.

Gen. 13. **Amallophora**, Scott, 1894.

Syn: *Scolecithrix*, Giesbrecht (part).
„ *Scaphocalanus*, G. O. Sars.

Generic Characters.—Body more or less slender, and of very different appearance in the two sexes. Cephalosome in female attenuated anteriorly, and sometimes exhibiting in front a distinct crest wholly wanting in male; rostral prominence very small and undivided, tentacular appendages exceedingly delicate and filiform. Last segment of metasome united with the preceding one. Urosome less abbreviated than in most other forms, genital segment in female comparatively short and scarcely at all protuberant below, caudal setæ rather unequal, the innermost but one being much longer than the others. Anterior antennæ in female consisting of 23 articulations, of which the first 2 are unusually large and sharply marked off from the succeeding ones; those in male rather slender and angularly curved in the middle, with some of the articulations coalesced. Posterior antennæ with both rami slender and elongated, especially the inner one. Mandibles with the 3 outer denticles of the cutting edge of the same appearance, bidentate, palp with the outer ramus exceedingly large, inner comparatively small. Anterior maxillipeds with the 3 outer appendages of the terminal part vermiform, the remaining 5 shorter and each terminating in a bud-like dilatation (amalla). Oral parts in male considerably transformed. 1st pair of natatory legs comparatively small, the succeeding ones very powerfully developed, with the inner ramus coarsely spinulous on the hind face; terminal spine of outer ramus strong, serrate outside. Last pair of legs in female distinctly developed, biarticulate or imperfectly triarticulate, last joint fusiform, with a slender denticulated spine inside, a very short one outside, and a somewhat longer one at the tip; those in male not very large, and rather asymmetrical, right leg with the 2nd basal joint greatly tumefied in its proximal part, and carrying inside a styliform appendage (inner ramus), its distal part attenuated and carrying at the tip a comparatively short 3-articulate appendage (outer ramus); left leg with the 2nd basal joint narrow cylindric, terminating in 2 subequal 3-articulate rami.

Remarks.—In the year 1894, the well-known Scotch naturalist, Th. Scott, published a most interesting Report on the Entomostraca collected during the expedition of the Telegraph Steamer "Buccaneer" in the gulf of Guinea. Among the numerous forms of Calanoids procured, there were some species, which, though on the whole exhibiting the characters of the genus *Scolecithrix* of Brady, differed very conspicuously in the peculiar transformation of some of the terminal

appendages to the anterior maxillipeds. These species were comprised within a particular sub-genus, to which the above-mentioned name was assigned. In my opinion, this sub-genus ought certainly to be raised to the rank of a true genus, as it also exhibits in several other respects well-marked differences from the type of the genus Scolecithrix, *S. danæ* (Lubbock). One of the species included in this genus, viz., *A. typica,* Scott, has since been removed by Dr. Giesbrecht, who considers it to be the male of a species of the genus *Xanthocalanus.* The other 3 species are, however, undoubtedly congeneric, and one of them, *A. magna,* Scott, I now consider to be identical with the form I have described from Nansen's Polar Expedition as *Scaphocalanus acrocephalus.* Another polar form, likewise described in my Account of the Crustacea of that Expedition, viz., *Scolecithrix brevicornis,* has turned out, on a closer examination, to belong to the same genus. According to more recent investigations, both these forms are referable to the fauna of Norway, and they will therefore be described below.

21. Amallophora magna, Scott.

(Pl. XXXIV & XXXV).

Amallophora magna, Th. Scott. Report on Entomostraca from the Gulf of Guinea. Transact. Linn. Soc. London, Vol. IV, Part I, p. 55, Pl. IV, figs. 5—9.

Syn: *Scolecithrix cristata*, Giesbrecht.
„ *Scaphocalanus acrocephalus,* G. O. Sars.

Specific Characters.—Female. Body moderately slender, with the anterior division pronouncedly navicular in form, being gradually attenuated anteriorly; combined cephalosome and 1st pedigerous segment occupying fully half the length of the entire body. Frontal part, seen laterally, narrowly rounded and surmounted by a very distinct, helmet-shaped crest. Lateral parts of last segment of metasome slightly angular below. Urosome equalling in length about $^1/_3$ of the anterior division, genital segment scarcely longer than the succeeding one. Caudal rami very short, about as long as they are broad, apical setæ much elongated, especially the innermost but one. Eye apparently very small. Anterior antennæ, when reflexed, reaching about to the end of the anterior division. Anterior maxillipeds with the pedicellated terminal appendages comparatively small. Last pair of legs imperfectly 3-articulate, middle joint very small and not distinctly defined from the terminal one.

Male rather more slender in form than female, frontal part somewhat abruptly contracted, but without any trace of a crest. Last segment of metasome with the lateral parts rounded off. Urosome considerably longer than in female,

exceeding half the length of the anterior division, genital segment very short, 2nd segment large and tumid, 5th segment very small; caudal rami mobile and generally spread out. Anterior antennæ with well-marked, band-like, sensory appendages on the proximal part, 8th joint about the length of the 4 preceding ones, and composed of several coalesced articulations, outer half of the antennæ very slender. Last pair of legs, when reflexed, scarcely reaching beyond the middle of the urosome; both legs of about the same length, rami of the left one nearly as long as the 2nd basal joint, and slightly incurved.

Colour not yet ascertained.

Length of adult female about 5 mm., of male $4^1/_2$ mm.

Remarks.—This form was first described by Th. Scott from a solitary, somewhat defective female specimen, found in a plankton-sample taken off the São Thomé Islands in the Gulf of Guinea. Apparently the same species was recorded the following year by Dr. Giesbrecht from the Pacific, under the name of *Scolecithrix cristata.* Neither of these statements had come under my notice when I was examining the plankton-material from Nansen's Polar Expedition. Indeed, I could not, at that time, have imagined, that any of the polar forms were to be sought for among species collected in the tropical parts of the ocean. Recent investigations have, however, proved that pelagic organisms may occasionally be carried far from their true home by submarine currents; and therefore a thorough acquaintance with those from other tracts of the oceans is indispensable in the determination of such organisms. I cannot, indeed, find any essential difference between the northern form and those observed by Th. Scott and Dr. Giesbrecht; and I am therefore inclined to believe that all these 3 forms belong to one and the same species, in spite of their widely remote occurrence.

The present species may be easily recognised, at any rate in the female sex, by the peculiar, helmet-shaped crest on the frontal part. The caudal setæ are very brittle, and it is rather unusual to meet with a specimen having them all uninjured. In the specimen examined by Th. Scott they were all broken at the base, and in the greater number of specimens collected during Nansen's Polar Expedition, they were also more or less defective. It is owing to this circumstance that they have not been correctly figured in my account of that Expedition. I have subsequently convinced myself that, as in other Scolecithricidæ, only 4 such setæ in reality occur on each caudal ramus, the 5th (outermost one) only being present in quite a rudimentary condition, as a minute hair. The extremely delicate terminal appendages of the anterior maxillipeds are also easily damaged, and their peculiar structure was not clearly seen in the polar specimens at first examined.

Occurrence.—This handsome Calanoid, which is undoubtedly of true arctic origin, has recently been stated by Mr. O. Nordgaard to occur off the Norwegian coast, he having found some specimens, together with other relict arctic forms, in the Herlö Fjord near Bergen, at a depth of about 400 metres. I have myself found it occasionally in 2 different plankton-samples taken during the cruise of the "Michael Sars" in 1900, the one from Stat. 9, located at some distance north of the Shetland Islands, the other from Stat. 34, east of Jan Mayen, the depth being recorded to be from 200 to 1000 metres.

Distribution.—Gulf of Guinea (Scott), Pacific in 35° N. Lat., 125° W. Long. (Giesbrecht), Polar basin crossed by Nansen, in many places rather abundant up to the very surface of the sea.

22. Amallophora brevicornis, G. O. Sars.

(Pl. XXXVI).

Scolecithrix brevicornis, G. O. Sars. The Norwegian North Polar Expedition. Crustacea, p. 46, Pl. X.

Specific Characters.—Female. Body rather shorter and more robust in form than in the preceding species, being less attenuated anteriorly, frontal part obtusely rounded, and without any trace of a crest. Last segment of metasome with the lateral parts angularly produced. Urosome comparatively slender, somewhat exceeding $^1/_3$ of the length of the anterior division. Caudal rami about twice as long as they are broad, apical setæ less elongated than in *A. magna*. Anterior antennæ comparatively short, not nearly attaining the length of the anterior division, but otherwise agreeing in structure with those in *A. magna*. Posterior antennæ likewise of a very similar appearance. Pedicellated sensory appendages of anterior maxillipeds comparatively larger, and curved in different directions. Natatory legs very powerfully developed, and of almost exactly the same structure as in *A. magna*. Last pair of legs likewise rather similar, though comparatively smaller, and each only composed of 2 joints.

Male unknown.

Colour not yet ascertained.

Length of adult female not quite 2 mm.

Remarks.—This form, first described by the present author from Nansen's Polar Expedition, was at that time erroneously referred to the genus *Scolecithrix* of Brady. On a closer examination, I have now convinced myself that it ought really to be included in the genus *Amallophora* of Scott, as the terminal appendages of the anterior maxillipeds exhibit the peculiar structure charac-

teristic of that genus, and as also a great similarity in the structure of the various other limbs is found to exist between this and the preceding species. This form, however, exhibits a rather different external appearance owing to the less pronounced navicular form of the anterior division of the body, the complete absence of any frontal crest, and the shortness of the anterior antennæ. It is also of far inferior size.

Occurrence.—A solitary, but well preserved, female specimen (the one here figured) of this arctic form was found in a plankton-sample taken during the cruise of the "Michael Sars" in 1900, at Stat. 34. As this Station is located within the limits of the Norwegian Sea, the present Calanoid may properly be included in the fauna of Norway.

Distribution.—Polar basin crossed by Nansen, in one place, north of 81° of latitude.

Gen. 14. **Scolecithricella**, G. O. Sars, n.

Syn: *Scolecithrix*, auctorum (part).

Generic Characters.—Body not very dissimilar in the two sexes, and of comparatively short and robust form, with the anterior division more or less strongly vaulted above, and very smooth, without any crest in front. Rostral prominence bifurcate, each half tipped with a short, soft lappet. Last segment of metasome united with the preceding one, and having the lateral parts rounded off. Urosome comparatively small, especially in female. Caudal setæ not much elongated, and subequal. Anterior antennæ in female rather slender, 22-articulate, the last 2 joints being confluent, in male transformed in the usual manner. Posterior antennæ with the outer ramus longer than the inner. Mandibles with the masticatory part but slightly expanded, inner ramus of palp well developed, though smaller than the outer. Maxillæ and posterior maxillipeds about as in *Amallophora*. Anterior maxillipeds, however, with all the terminal appendages of the same appearance, vermiform. Oral parts in male slightly transformed. Natatory legs remarkably elongated, resembling in structure those in *Amallophora*; terminal spine of outer ramus, however, not serrate, but very minutely denticulated outside. Last pair of legs present in both sexes, in female very small, uniarticulate, lamellar, with 2 comparatively short spines inside the tip; in male considerably produced, right leg the longer and carrying at the end of the 2nd joint a styliform appendage, left leg simple, with the 1st joint conspicuously dilated distally.

Remarks.—I have felt justified in establishing this new genus to include a number of species previously referred to the genus *Scolecithrix* of Brady, but, like *Amallophora,* differing materially from the type of this genus, *S. danæ* (Lubbock), in the presence in the female of a 5th pair of distinct, though small legs. This genus differs from *Amallophora* in the structure of these legs in both sexes, as also in the uniform appearance of the terminal appendages of the anterior maxillipeds, these being all vermiform as in *Scolecithrix.* The type of this genus is *S. minor* of Brady, a species which seems to have a very wide distribution, and also belongs to the Norwegian fauna. In addition to this, the following Mediterranean species, recorded by Dr. Giesbrecht, are in all probability referable to the same genus, viz. *S. vittata, tenuiserrata, profunda, longipes, abyssalis, dubia, dentata, marginata, longifurca.* In the Northern Ocean, only the type species is represented.

23. Scolecithricella minor (Brady).

(Pl. XXXVII & XXXVIII).

Scolecithrix minor, Brady, Report on the Copepoda of the Challenger Expedition, p. 58, Pl. XVI, figs. 15, 16; Pl. XVII, figs. 1—5.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong oval in form, greatest width but slightly exceeding $^1/_3$ of the length, anterior extremity narrowly rounded, posterior somewhat contracted; seen laterally, gently vaulted above and obtusely truncated anteriorly, the dorsal margin forming a remarkably bold curvature in front. Last segment of metasome with the lateral parts somewhat lamellar, forming an obtuse corner below. Urosome unusually small and narrow, only slightly exceeding $^1/_4$ of the length of the anterior division, genital segment constricted at the base and not at all protuberant below. Caudal rami comparatively short and somewhat divergent, with all the apical setæ of the same length. Eye very small, subventral. Anterior antennæ moderately slender, reaching, when reflexed, about to the end of the anterior division of the body, the first 2 articulations not distinctly defined. 2nd and 3rd pairs of natatory legs with scattered spinules on the hind face of both rami; 4th pair without such spinules. Last pair of legs forming each a broadly oval lamella armed inside the tip with 2 unequal spines, the distal one very small, the proximal one about half the length of the lamella, outer edge with a small ledge at about the middle.

Male resembling the female both in size and general form, though having the urosome more elongated and, as usual, 5-articulate, last segment very short. Caudal rami comparatively shorter than in female and mobile. Anterior antennæ with well-marked, band-like, sensory appendages on the proximal part, and angularly

curved in the middle, number of articulations considerably reduced. Last pair of legs very slender, reaching beyond the tip of the urosome, terminal joint of right leg bayonet-shaped, that of left leg transformed to a thin oblong lamella.

Colour. Body in both sexes highly pellucid, and almost without any pigment; natatory legs, however, generally tinged with yellow.

Length of adult female 1.40 mm., of male about the same.

Remarks.—I have been in some doubt about the identification of this form, chiefly because Prof. Brady describes the 5th pair of legs in the female as 3-articulate. I think, however, that this must be due to a mistake, and that in all probability the legs figured do not belong to a female specimen, but more properly to an immature male. Otherwise the figures given agree pretty well with the present form, the peculiar bayonet-shaped appearance of the terminal joint of the right last leg in the adult male being exactly alike in the 2 forms.

Occurrence.—I have met with this form occasionally along the greater part of the Norwegian coast, from the Christiania Fjord northwards at least to the Lofoten Islands. It has also recently been found, though rather sparingly, in some of the plankton-samples taken in the open sea during the cruise of the "Michael Sars" in 1900. In its habits this Calanoid is a true pelagic form, often occurring close to the surface of the sea.

Distribution.—North Atlantic Ocean (Brady), Gulf of Guinea (Scott), Indian Ocean (Giesbrecht).

Section 2.

Isokerandria.

This new section is established to comprise a number of Calanoids which are distinguished from those belonging to the 2 sections recorded by Dr. Giesbrecht (Amphascandria and Heterarthrandria) by the fact, that the anterior antennæ do not exhibit any conspicuous difference in the two sexes, and that the oral parts, as a rule, are also of much the same appearance in the male and the female. The hitherto known forms belonging to this section had previously been referred partly to the *Scolecithricidæ*, partly to the *Pseudocalanidæ*, and partly to

the *Misophriidæ*. I think, however, that at any rate some of these forms ought to be regarded as types of particular families. 4 such families are here established, each as yet containing only a very limited number of genera. It is however very probable that the number of genera will be considerably increased in the future; for, owing to the peculiar habits of these Calanoids, our knowledge of the existing forms is certainly still very imperfect. They all agree in being pronounced bottom-forms, and cannot of course be captured in the ordinary tow-net, but only by the aid of the dredge or by some other implements with which the very bottom is swept. As they are of a very small size, moreover, it will be easily understood, that they may to a great extent have escaped the attention of Carcinologists. Indeed, our knowledge regarding these peculiar Calanoids we owe almost exclusively to Th. Scott, who has succeeded in discovering many interesting deep-water Copepods by subjecting the trawl-refuse of fishermen to a minute microscopical examination. From other countries, we only know one solitary form referable to this section, viz. the peculiar Calanoid first described by Dr. Giesbrecht as *Moebianus gyrans,* a form which was only observed in the aquaria of the Zoological Station in Naples, having probably been transferred to them quite accidentally with the various bottom-organisms (Hydroids or Corals) growing in them. I myself, by the aid of a very light dredge, long ago procured several forms belonging to this section at different parts of the Norwegian coast. These will be described below. On the other hand, I have not felt justified in including in the Norwegian fauna any of the additional species observed off the Scottish coast, by Th. Scott, on account of the non-pelagic character of those Calanoids.

Fam. 9. Diaixidæ.

Characters.—General habitus recalling that in the *Scolecithricidæ*. Cephalosome united with the 1st pedigerous segment, front produced below to an undivided rostrum. Last segment of metasome distinctly defined from the preceding one. Urosome comparatively small, in female composed of 4, in male of 5 segments; caudal rami short, each with 4 subequal apical setæ. Eye distinct, double. Anterior antennæ scarcely differing in the two sexes, comparatively slender, with the last 2 articulations well defined. Posterior antennæ with the inner ramus unusually small. Oral parts on the whole resembling in structure those in the *Scolecithricidæ,* the terminal appendages of the anterior maxillipeds

having a similar vermiform shape. Natatory legs with the same number of joints in the rami as in that family. Last pair of legs wholly absent in female, in male of extraordinary size and very complicated structure.

Remarks.—This family bears a close resemblance in several points to the *Scolecithricidæ*, yet differing very materially, both in the uniform appearance of the anterior antennæ in the two sexes, and in the enormous development and peculiar structure of the last pair of legs in the male. It contains as yet but a single genus, to be described below.

Gen. 15. **Diaixis**[1]), G. O. Sars, n.

Syn: *Scolecithrix*, Scott (part).

Generic Characters.—Body not very slender, with the anterior division much vaulted in front. Rostral prominence simple, deflexed, without any tentacular filaments. Last segment of metasome in female with the lateral parts lamellarly produced. Urosome comparatively short, genital segment in female produced dorsally. Eyes subventral, placed close together, though well defined in the middle. Anterior antennæ 24-articulate, with some of the setæ of the terminal joints ciliated. Posterior antennæ with the outer ramus very large, 6-articulate, last joint much the longest. Mandibles slender, with the masticatory part scarcely at all expanded, inner ramus of palp poorly developed. Anterior maxillipeds with the terminal appendages very delicate and all of the same appearance. Posterior maxillipeds with the terminal part unusually short and reflexed. Natatory legs slender, without any spinules on the hind face, terminal spine of outer ramus in the 2nd to 4th pairs coarsely denticulate outside. Last pair of legs in male transformed to a powerful grasping organ, attached to the body by a thin and flexible stalk, and composed of a large and tumid basal part and 2 rami of nearly equal length, the right one forming the immediate continuation of the basal part, the left one beig movably articulated to its posterior face.

Remarks.—This genus is established to include the peculiar form described by Mr. A. Scott as *Scolecithrix hibernica*, which species most certainly does not belong to Brady's genus. In addition to the typical form, another nearly-allied species has been recorded by Th. Scott as *Scolecithrix pygmæa*. Only the first of these species belongs to the fauna of Norway.

[1]) Nomen proprium.

24. Diaixis hibernica (A. Scott).

(Pl. XXXIX & XL).

Scolecithrix hibernica, Andr. Scott, Ann. Nat. Hist., 6th series, Vol. 18, p. 362, Pl. XVII & XVIII.

Specific Characters.—Female. Anterior division of body, seen dorsally, elliptical in form, greatest width not attaining half the length, anterior extremity narrowly rounded, posterior considerably contracted; seen laterally evenly vaulted above and somewhat widening anteriorly, dorsal margin curving abruptly in front, rostral prominence conical in form and extended straight downwards. Last segment of metasome very short and deeply emarginated in the middle, lateral projections irregularly triangular, and defined above by a slight incision of the margin, being closely applied to the genital segment, to the end of which they extend. Urosome not attaining even $^1/_3$ of the length of the anterior division, genital segment with a very conspicuous gibbous prominence dorsally. Caudal rami somewhat longer than they are broad, and slightly dilated distally, each with a small dentiform projection outside the apical setæ, the latter but very slightly divergent and somewhat exceeding the urosome in length. Anterior antennæ, when reflexed, reaching about to the end of the genital segment. Posterior antennæ with the outer ramus more than twice the length of the inner. Anterior maxillipeds with about 5 vermiform appendages at the tip. Posterior maxillipeds with the terminal part scarcely exceeding $^1/_3$ of the length of the 2nd basal joint. Natatory legs successively increasing in length posteriorly, 4th pair very slender, with the terminal joint of outer ramus almost linear in form, and having the proximal spine of the outer edge placed beyond the middle.

Male on the whole resembling the female in the general shape of the body, but having the last segment of metasome very small and not produced laterally. Urosome more slender, and as usual 5-articulate, last segment very short. Last pair of legs, when reflexed, reaching far beyond the tips of the caudal setæ, basal part with a comb-like series of about 5 curved spines on the left side; right ramus somewhat band-like, irregularly flexuous and carrying on the tip a movable hand-like piece produced into 2 digitiform processes, left ramus 4-articulate, with the 2nd joint the largest and produced outside into several irregular projections, last 2 joints comparatively short and somewhat lamellar, the terminal one carrying inside a slender flexuous seta and 2 short spines.

Colour. Body in both sexes pellucid, with a faint carneous tinge, and partly mottled with a pale rose pigment.

Length of adult female 1.20 mm., of male 1.10 mm.

Remarks.—This form was first described in the year 1896 by Mr. Andrew Scott, the son of the well-known Scottish naturalist, Thomas Scott, from specimens procured in the Irish Channel by the aid of a small tow-net fastened to the beam of a fish-trawl. I had myself long before observed this form in the upper part of the Christiania Fjord, and had assigned to it the provisional name *Diaixis oleacea,* owing to a peculiarity to be mentioned farther on. This form, though resembling in its external appearance some species of the genus *Scolecithricella,* may on a closer inspection be easily recognized in both sexes, the female by the peculiar adpressed lateral projections of the last segment of the metasome, the male by its enormously developed legs of last pair.

Occurrence.—In addition to the Christiania Fjord, where it is rather common, I have met with this form occasionally in several other places of the Norwegian coast, as far as up to the Trondhjem Fjord. It is found in moderate depths, ranging from 20 to 60 fathoms, on a muddy bottom, and always close to the ground. For capturing this and other delicate bottom-organisms, I have employed a very light dredge, by which only a small portion of the superficial bottom-material is taken up. If this material be placed together with a small amount of sea-water in a shallow vessel, the specimens will at once make their appearance, owing to a peculiarity which they have in common with some other micro-organisms, namely, that when coming in contact with the surface, they invariably remain on it, floating about like small air-bubbles, and they can thus easily be picked up by the aid of a small feather.

Distribution.—Irish Channel (A. Scott), Scottish coast: Firth of Clyde, Moray Firth, off Fair Islands (Th. Scott).

Fam. 10. Stephidæ.

Characters.—Form of body generally short and stout, not very dissimilar in the two sexes. Cephalosome united with the 1st pedigerous segment, front simple, without any rostral prominence or tentacular appendages. Last 2 segments of metasome coalesced. Urosome in female composed of 4, in male of 5 segments. Eye wholly absent. Anterior antennæ of exactly the same appearance in the two sexes, and rather slender, with the last 2 joints distinctly defined. Posterior antennæ and oral parts normal, the latter not transformed in male.

Terminal appendages of anterior maxillipeds not sensory. Natatory legs with the same number of joints in the rami as in the *Diaixidæ*, but not nearly so elongated. Last pair of legs present in both sexes, in female rather small and of simple structure, in male largely developed, uniramous, left leg the largest and having some of the joints conspicuously dilated.

Remarks.—The type of this family is the genus *Stephos* of Scott (= *Moebianus*, Giesbr.), which was placed by Dr. Giesbrecht within his subfamily *Clausocalaninæ*, answering to the family *Pseudocalanidæ* of the present account. I think, however, that this arrangement is quite inadmissible, since this genus differs in several points very essentially from the other genera of this family. The uniform structure of the anterior antennæ and the oral parts in both sexes proves it in reality to belong to the section *Isokerandria*, as here defined. The present family likewise differs rather materially from the *Diaixidæ* in the structure of the anterior maxillipeds, as also in the presence of distinctly developed, though small, legs of the 5th pair in the female, and the structure of these legs in the male. In addition to the typical genus, *Stephos* Scott, another apparently nearly-allied genus, *Parastephos*, will be described below.

Gen. 16. **Stephos**[1]), Scott, 1892.

Syn: *Moebianus*, Giesbrecht.

Generic Characters.—Body of a rather short and compact form, with the anterior division more or less tumefied. Front cut off, as it were, below, and not forming any perceptible prominence. Lateral parts of last segment of metasome rounded off, sometimes lamellarly expanded. Urosome comparatively short; caudal rami likewise short, but with the apical setæ rather elongated. Anterior antennæ moderately slender, 24-articulate, with scattered bristles in front. Posterior antennæ with the outer ramus longer than the inner. Anterior lip remarkably prominent. Mandibles strong, with the masticatory part somewhat expanded, outermost denticle not very different from the others; palp with the inner ramus fully as large as the outer. Anterior maxillipeds comparatively small; posterior ones well developed, with the terminal part elongated and not reflexed. Natatory legs with the rami normal in both sexes. Last pair of legs in female 3-articulate,

[1]) I do not consider it necessary to change this name to *Stephus*, as proposed by Dr. Giesbrecht, since there are several generic names generally admitted in Zoology, which have a similar Greek termination (Rhinoceros, Aceros, etc.)

with the last joint spiniformly produced; those in male very large, both legs well defined and angularly curved near the base, the right one 4-articulate, terminating ist a more or less claw-like piece, left 5-articulate, with the penultimate joint much tumefied, last joint incurved and provided with a number of delicate leaf-like appendages.

Remarks.—As above stated, this genus was first (in the year 1892) established by Th. Scott, to include a small Calanoid found by him off the Scottish coast, *S. minor*. In the same year, but somewhat later, Dr. Giesbrecht described a Mediterranean form, undoubtedly belonging to the same genus, under the name of *Moebianus gyrans*. and a 3rd species was subsequently recorded by Th. Scott as *S. Fultoni*. I have myself observed 2 additional species off the Norwegian coast, to be described below. The genus accordingly comprises at present 4 different species. In all these species the last pair of legs in both sexes are built upon the very same type, though those of the male, at any rate, exhibit characteristic differences in each species.

25. Stephos lamellatus, G. O. Sars, n. sp.

(Pl. XLI & XLII).

Specific Characters.—Female. Body very short and robust, more so than in any of the other species, with the anterior division, seen dorsally, broadly oval in form, greatest width exceeding half the length, anterior extremity narrowly rounded, posterior slightly contracted and somewhat irregular; seen laterally, moderately vaulted above, dorsal margin forming, in front, a perfectly even curve. Last segment of metasome deeply emarginated in the middle, lateral parts lamellarly expanded and conspicuously asymmetrical, right lamella much larger and broader than left. Urosome very short, scarcely attaining $^1/_3$ of the length of the anterior division, genital segment asymmetrical, exhibiting on right side a rounded lamellar prominence, but without any spiniform processes. Caudal rami scarcely longer than they are broad, apical setæ exceeding in length the urosome. Anterior antennæ rather slender, reaching, when reflexed, to the base of the caudal rami. Posterior antennæ with the outer ramus only slightly longer than the inner. Last pair of legs with the terminal joint nearly straight, carrying outside, at some distance from the base, a small spinule, distal part spiniform and very finely ciliated outside.

Male resembling the female both in size and general form of body, but having the lateral parts of the last segment of metasome symmetrical and not lamellarly expanded. Urosome somewhat narrower, and, as usual, composed of

5 segments besides the caudal rami. Last pair of legs very massive, both legs of about equal length, but very dissimilar in form, penultimate joint of right leg rather elongated and somewhat lamellar in form, gradually tapering distally, terminal joint of same leg rather irregular in shape, with several obtuse, digitiform processes; penultimate joint of left leg very large and tumid, with a strong spiniform process inside at the base, and a row of delicate spinules along the inner face, terminal joint carrying at the tip a dense fascicle of lanceolate, leaf-like appendages.

Colour. Body in both sexes very pellucid and ornamented with a beautiful rosy pigment.

Length of adult female somewhat exceeding 1 mm., of male about the same.

Remarks.—This form may easily be recognized from any of the other species by its unusually short and robust form, as also by the lamellarly expanded lateral parts of the last segment of the metasome in the female, and the structure of the last pair of legs in both sexes. It is also of a larger size than any of the other known species.

Occurrence.—I have met with this form not unfrequently at Bodö and Hammerfest, Finmark, in depths of about 30 fathoms, muddy bottom. I have also come across it, though only occasionally, off the west coast of Norway (Christiansund).

26. Stephos Scotti, G. O. Sars, n. sp.

(Pl. XLIII).

Syn: *Stephos gyrans*, Scott (not Giesbrecht).

Specific Characters.—Female. Body comparatively less robust than in the preceding species, with the anterior division, seen dorsally, regularly elliptical in form, greatest width scarcely exceeding half the length, both extremities almost equally tapered; seen laterally, considerably vaulted above, with the dorsal margin strongly curved in front. Lateral parts of last segment of metasome perfectly symmetrical, not lamellarly expanded. Urosome exceeding in length $^1/_3$ of the anterior division, genital segment symmetrical, without any prominences or processes. Caudal rami somewhat longer than they are broad, apical setæ rather slender. Anterior antennæ, when reflexed, reaching about to the end of the 2nd caudal segment; posterior antennæ with the outer ramus almost twice as long as the inner. Last pair of legs with the terminal joint slightly flexuous, without any spinule at the base, but armed outside the distal part with about 10 coarse denticles.

Male somewhat smaller than female, and having the urosome considerably more slender. Last pair of legs very large, with the right leg somewhat longer and much more slender than left, its penultimate joint rather narrow and produced at the base outside to an acute lappet, terminal joint forming a strong curved claw, with a thumb-like projection at the base inside; penultimate joint of left leg much tumefied, but quite simple, without any processes or spinules, terminal joint carrying a row of 4 rather small leaf-like appendages outside, and at the tip 2 short, juxtaposed claw-like lamellæ.

Colour. Body in both sexes extremely pellucid, with a very faint yellowish tinge.

Length of adult female 0.95 mm., of male 0.85 mm.

Remarks.—This species is easily distinguished from the preceding one by its more slender form, the perfect symmetry of both the last segment of the metasome and of the genital segment, and finally by the structure of the last pair of legs in both sexes. The form recorded by Th. Scott from the Scottish coast as *S. gyrans*, Giesbrecht, is identical with the present species, as proved by the examination of a specimen kindly sent to me by that author. The female of the Mediterranean species differs very conspicuously in the asymmetrical shape of both the last segment of the metasome and the genital segment, the latter being moreover distinguished by a number of irregularly arranged spiniform processes not found in any of the northern species. In the male of that species, too, the last pair of legs, as figured by Dr. Giesbrecht, exhibit well marked differences from those in the present species, which more resemble those in *S. minor* of Scott.

Occurrence.—I observed this form, many years ago, in a single locality on the west coast of Norway, viz., Eggesbönæs, south of Aalesund. It occurred here not unfrequently at a depth of a few fathoms, on a sandy bottom covered with a thin layer of dark mud; and it was several times watched in the living state. Its movements are rather curious, constituting a perfectly regular whirling run, in which the body is kept in a horizontal attitude just above the bottom. For this reason I assigned to it the provisional name of *Typhlocalanus gyrator*, the generic name referring to the entire absence of visual organs. The same peculiar manner of motion is also mentioned by Dr. Giesbrecht in the Mediterranean species, and is most probably common to all the species of this genus.

Distribution.—Scottish coast: Loch Fyne, Firth of Forth (Scott.)

Gen. 17. **Parastephos**, G. O. Sars, n.

Generic Characters.—Form of body more slender than in *Stephos,* with the anterior division less tumefied and the urosome more elongated. Front blunt below, as in *Stephos.* Antennæ about as in that genus. Oral parts likewise of a very similar structure, except that the masticatory part of the mandibles is considerably more expanded, with the outermost cutting-tooth very large and claw-like. Natatory legs not particularly powerful, some of them (in male) peculiarly transformed. Last pair of legs in male largely developed and very asymmetrical, right leg slender and terminating in a strong denticulated claw, left leg much coarser, with the antepenultimate joint the largest.

Remarks.— This new genus is founded upon a solitary male specimen, which, though evidently referable to the present family, exhibits so many essential differences from the males of the genus *Stephos,* that it cannot properly be included in that genus. It is very probable, that also the female, when found, will exhibit some peculiarities, at least in the structure of the last pair of legs.

27. Parastephos pallidus, G. O. Sars, n. sp.

(Pl. XLIV).

Specific Characters.—Male. Anterior division of body, seen dorsally, oblong oval in form, greatest width not attaining half the length, anterior extremity narrowly rounded, posterior less attenuated; seen laterally, moderately vaulted above, with the dorsal margin forming a perfectly even curve as far as the blunt rostral part. Last segment of metasome with the lateral parts but slightly produced and narrowly rounded at the tip. Urosome comparatively slender, considerably exceeding half the length of the anterior division, last segment well developed. Caudal rami somewhat longer than they are broad, and not at all divergent; apical setæ about as in *Stephos.* Eye, as in that genus, wholly absent. Anterior antennæ, when reflexed, reaching about to the end of the 3rd caudal segment, structure exactly as in *Stephos.* Posterior antennæ with the outer ramus considerably longer than the inner. Outer ramus of right 2nd leg peculiarly transformed, being quite short, not even attaining the length of the inner ramus, and composed of only 2 joints, the proximal one simple, the distal one carrying at the tip 4 natatory setæ and a single spine outside them. Inner ramus of right, 4th leg much larger than that of the left, middle joint considerably dilated,

terminal one armed on the hind face with 2 very coarse spinules, and having moreover the proximal seta of the inner edge transformed into a slender spine, denticulated inside. Last pair of legs, when reflexed, reaching to the end of the caudal rami, distal part of right leg very narrow and (in the specimen examined) doubled back upon the proximal part, terminal claw very strong and somewhat flexuous, with a regular row of denticles along the concave edge; left leg with the antepenultimate joint much dilated, and projecting at the end outside into an oval lamella, terminal joint spoon-shaped.

Colour. Body highly pellucid, with a very faint yellowish tinge.

Length of adult male 1.90 mm.

Remarks. As stated above, this form is as yet only known in the male sex. The female will in all probability be less slender in form, with the urosome shorter and 4-articulate. Whether the last pair of legs of the female is constructed after the type of the species of *Stephos*, cannot be conjectured at present.

Occurrence.—The solitary specimen described above was found, many years ago, at Sjerjehavn, west coast of Norway, in a depth of about 100 fathoms, soft, muddy bottom.

Fam. 11. Tharybidæ.

Characters.—Form of body short and stout. Cephalosome united with the 1st pedigerous segment, front carrying below 2 soft tentacular appendages. Last 2 segments of metasome coalesced. Urosome short, in female 3-articulate, in male 4-articulate, the last segment being obsolete. Eye present. Anterior antennæ slender and of exactly the same appearance in the two sexes. Posterior antennæ with the outer ramus much larger than the inner. Oral parts of same appearance in the two sexes, and rather differing in structure from those in the 2 preceding families; terminal appendages of anterior maxillipeds very delicate, sensory. Natatory legs with the same number of joints in the rami as in the 2 preceding families. Last pair of legs present in both sexes, in female of comparatively simple structure, in male very large, though rather slender in form, with none of the joints conspicuously dilated.

Remarks.—This new family at present comprises only a single genus, which, however, cannot properly be placed in any of the other families here recorded. In some features, and more especially in the structure of the anterior maxillipeds, it exhibits some resemblance to the *Phaënnidæ*; but the uniform appearance of both the anterior antennæ and the oral parts in the two sexes proves it in reality not to belong even to the same section, but evidently to the one here in question, viz., the *Isokerandria*.

Gen. 18. **Tharybis**[1]), G. O. Sars, n.

Generic Characters. Body unusually short, with the anterior division considerably tumefied. Front without any rostral prominence. Urosome rather short in female, considerably more slender in male. Caudal rami short, each with 3 apical setæ. Eye of a somewhat unusual appearance, being very large and placed close to the dorsal face. Anterior antennæ 24-articulate, with scattered bristles in front, last 2 articulations well defined. Posterior antennæ with the inner ramus rather small. Mandibles strong, with the masticatory part very compact, cutting edge exhibiting outside 2 unusually strong bifid teeth followed by a dense series of partly ciliated setæ, palp with both rami well developed. Maxillæ of a somewhat unusual appearance, the masticatory lobe being exceedingly large, with strong spines inside, whereas the palp is comparatively poorly developed. Anterior maxillipeds with the terminal appendages extremely delicate and penicillate at the tip, as in the *Phaënnidæ*. Posterior maxillipeds not much elongated, 2nd basal joint fusiform, terminal part comparatively short and not reflexed. Natatory legs of moderate size, and without any spinules on the hind face. Last pair of legs in female 3-articulate, terminal joint linear and strongly spinous at the tip; in male very large and rather asymmetrical, left leg biramous, right simple.

Remarks.—Dr. Giesbrecht would probably have placed this genus within his sub-family *Scolecithricinæ*, which also comprises the genera *Xanthocalanus* and *Phaënna;* and indeed, in external appearance, and more especially in the structure of the anterior maxillipeds, it strongly recalls the last-mentioned genus. It is, however, in reality very different, being not only distinguished by the uniform appearance in the two sexes of both the anterior antennæ and the oral parts, but also by the presence in the female of distinctly developed legs of the 5th pair. We know at present only a single species, to be described below.

[1]) Nomen proprium.

28. Tharybis macrophthalma, G. O. Sars, n. sp.

(Pl. XLV & XLVI).

Specific Characters.—Female. Anterior division of body, seen dorsally, regularly elliptical in form, greatest width equalling about half the length, both extremities almost equally attenuated; seen laterally, much vaulted above, with the dorsal margin forming quite an even curve throughout. Front scarcely at all produced below, tentacular filaments very delicate and reflexed. Lateral parts of last segment of metasome but slightly produced, forming narrowly rounded lobes. Urosome scarcely exceeding in length $^1/_3$ of the anterior division, genital segment about twice as large as the succeeding one, and slightly protuberant below. Caudal rami a little longer than they are broad, apical setæ of moderate length, the innermost but one the longest. Eye very large and conspicuous in the living animal, oblong quadrangular in form, and occurring close to the dorsal face, pigment bright red. Anterior antennæ, when reflexed, reaching about to the end of the anterior division. Posterior antennæ with the inner ramus scarcely half as long as the outer, terminal joint of the latter much the largest. Last pair of legs with the terminal joint more than twice the length of the other 2 combined, nearly straight and of uniform width throughout, exhibiting outside in the middle a small dentiform projection, tip armed with 3 short, thick, denticulated spines, the innermost the largest and distinctly defined at the base, the other 2 confluent with the joint.

Male somewhat smaller than female, and having the urosome considerably more slender, equalling about half the length of the anterior division. Last pair of legs, when reflexed, reaching far beyond the caudal rami, right leg doubly geniculate, 3-articulate, 1st joint rather thick and forming outside an angular prominence, 2nd joint slender, slightly widening distally, terminal joint constituting a claw-like incurved piece; left leg with the 2 basal joints very movably connected, outer ramus 3-articulate, terminating in a bunch of delicate hairs, inner ramus uniarticulate, styliform, and nearly twice as long as the outer.

Colour.—Body in both sexes highly pellucid, with translucent dark yellowish brown intestine.

Length of adult female 1.40 mm., of male 1.30 mm.

Remarks.—This Calanoid may be easily recognized by its unusually short and robust form, and in the living state, also by the large, dorsally placed, bright red eye. The anterior antennæ in the living animal are born in a somewhat unusual manner, exhibiting at the base an abrupt curve, and pointing obliquely backwards.

Occurrence.—I first found this peculiar Calanoid, many years ago, in the Christiania Fjord at Drøbak, where some few specimens were taken up in the dredge from a depth of about 100 fathoms. Subsequently I have also met with it occasionally off the west coast of Norway, and as far north as in the Trondhjem Fjord, where a solitary specimen was procured from a depth of about 150 fathoms.

Fam. 12. Pseudocyclopiidæ.

Characters.—Form of body unusually compact, recalling that in some of the *Cyclopoida.* Cephalosome confluent with the 1st pedigerous segment; front produced below to a distinct rostrum. Last 2 segments of metasome united. Urosome in female distinctly 4-articulate, in male 5-articulate. Eye wholly absent. Anterior antennæ of exactly the same appearance in the two sexes, and remarkable for their shortness and restricted number of articulations. Posterior antennæ with the basal part imperfectly defined from the inner ramus, which is much longer than the outer. Oral parts on the whole normal, except the mandibles, the cutting edge of which does not exhibit the regular dentition found in other Calanoids. Natatory legs having the same number of joints in the rami as in the 3 preceding families, being, however, distinguished by their unusually short and compact form, somewhat recalling that in the *Cyclopoida.* Last pair of legs present in both sexes, in female comparatively simple, in male rather complicated and very asymmetrical.

Remarks.—This new family is established to include the genus *Pseudocyclopia* of Scott, which, though evidently belonging to the present section, cannot properly be placed in any of the 3 preceding families. It is more especially the unusual appearance of the 2 pairs of antennæ, which distinguishes this genus, and tends to remove it from the general Calanoid type. We are at present only acquainted with this solitary genus; but it is very probable, that on a future, closer examination of the small Calanoids living at the bottom of the sea, some other nearly-related genera will be found to exist.

Gen. 19. **Pseudocyclopia,** Scott, 1892.

Generic Characters.—Body short and compact, with the anterior division strongly vaulted above and more or less compressed. Rostral prominence deflexed, without any tentacular appendages. Lateral parts of last segment of metasome rounded off. Urosome with the last segment well developed in both sexes; caudal rami short, each with 4 apical setæ. Anterior antennæ very unlike those in other Calanoids, being unusually short and tapering rapidly distally, with 16 to 20 articulations, the 1st very large. Posterior antennæ with the outer ramus 6-articulate and much shorter than the inner. Mandibles very strong, masticatory part thickened and having the cutting edge irregularly curved and minutely denticulate, palp with both rami well developed. Maxillæ normal. Anterior maxillipeds with the terminal appendages simple, setiform. Posterior maxillipeds slender, with the 1st basal joint remarkably produced at the end anteriorly; terminal part reflexed. Natatory legs with the spines of the outer ramus remarkably strong, the terminal one in 2nd to 4th pairs coarsely serrate outside; seta of the 1st basal joint in 3rd pair transformed to a strong elongated spine. Last pair of legs in female 3-articulate, terminal joint the largest and spiniferous; those in male of moderate size, both legs uniramous, the right terminating in a styliform claw, the left with the basal part considerably tumefied, outer part slender, triarticulate.

Remarks.—This genus, established by Th. Scott, was erroneously referred by that author to the family *Misophriidæ*, which, as shown by Dr. Giesbrecht, does not even belong to the *Calanoida*, but more properly to the *Cyclopoida*. The generic name *Pseudocyclopia*, proposed by Th. Scott, bears an inconvenient resemblance to *Pseudocyclops*, a genus which does not belong to this, but to the next section (Heterarthrandria), though it certainly exhibits some resemblance in its external appearance, to the genus in question. Th. Scott records no less than 3 different species of this genus, viz., *P. crassicornis, minor* and *caudata*, all of them found in the Firth of Forth. None of these species have hitherto come under my notice. On the other hand, a form observed by me many years ago off the west coast of Norway, has proved to be identical with a 4th species recently described by Mr. Thompson from Liverpool Bay. This species will be described below.

29. Pseudocyclopia stephoides, Thompson.

(Pl. XLVII & XLVIII).

Pseudocyclopia stephoides, J. C. Thompson. Proc. Liverp. Biol. Soc., Vol. 9, p. 96, Pl. 6, figs. 1, 2, Pl. 7, figs. 8—14.

Specific Characters.—Female. Anterior division of body, seen dorsally, of nearly uniform width throughout, and oblong oval in form, anterior extremity obtusely rounded, posterior scarcely at all contracted; seen laterally, considerably vaulted above, dorsal margin forming in front a perfectly even curve as far as the rostrum; the latter somewhat flattened and acutely triangular in form. Lateral parts of last segment of metasome forming short rounded lobes. Urosome comparatively robust, about equalling in length $^1/_3$ of the anterior division, and without any dorsal processes (present in *P. minor)*, genital segment about the length of the 2 succeeding segments combined. Caudal rami only slightly longer than they are broad, and obliquely rounded at the tip, apical setæ of moderate length. Anterior antennæ not attaining even half the length of the anterior division of body, and composed of 20 articulations, the 1st of which is very large, though not attaining half the length of the remaining part of the antennæ. Posterior antennæ with the inner ramus remarkably produced, being about twice as long as the outer. Last pair of legs with each of the first 2 joints exhibiting a small dentiform projection inside, 2nd joint not conspicuously dilated, terminal one produced at the tip to a slender, straight spine, and carrying outside, attached to separate ledges, 2 similar, though somewhat smaller spines.

Male resembling the female both in size and general form, though having the urosome, as usual, more slender. Last pair of legs very asymmetrical, right leg exceedingly slender, with the terminal joint occupying more than half its length and having the distal part straight and band-like; left leg with the basal part tumefied to an extraordinary degree, penultimate one carrying outside, at some distance from the base, a small seta, distal part slightly expanded and having on each side an acute lappet, terminal joint small and somewhat spoon-shaped.

Colour. Body in both sexes pellucid, with a faint yellowish tinge.

Length of adult female 1.20 mm., of male about the same.

Remarks.—This is the largest of the 4 hitherto known species, and moreover easily recognized by the 20-articulate anterior antennæ, the greatly produced inner ramus of the posterior ones, and the structure of the last pair of legs in both sexes. In its external appearance it bears a very close resemblance to *P. crassicornis*, Scott, which, however, has the anterior antennæ still shorter and composed of only 16 articulations.

Occurrence.—Some few specimens of this form were found, many years ago, at Christiansund, west coast of Norway, in a depth of about 30 fathoms. This is the only place on the Norwegian coast where I have as yet met with it.

Distribution.—Liverpool Bay (Thompson).

Section 3.

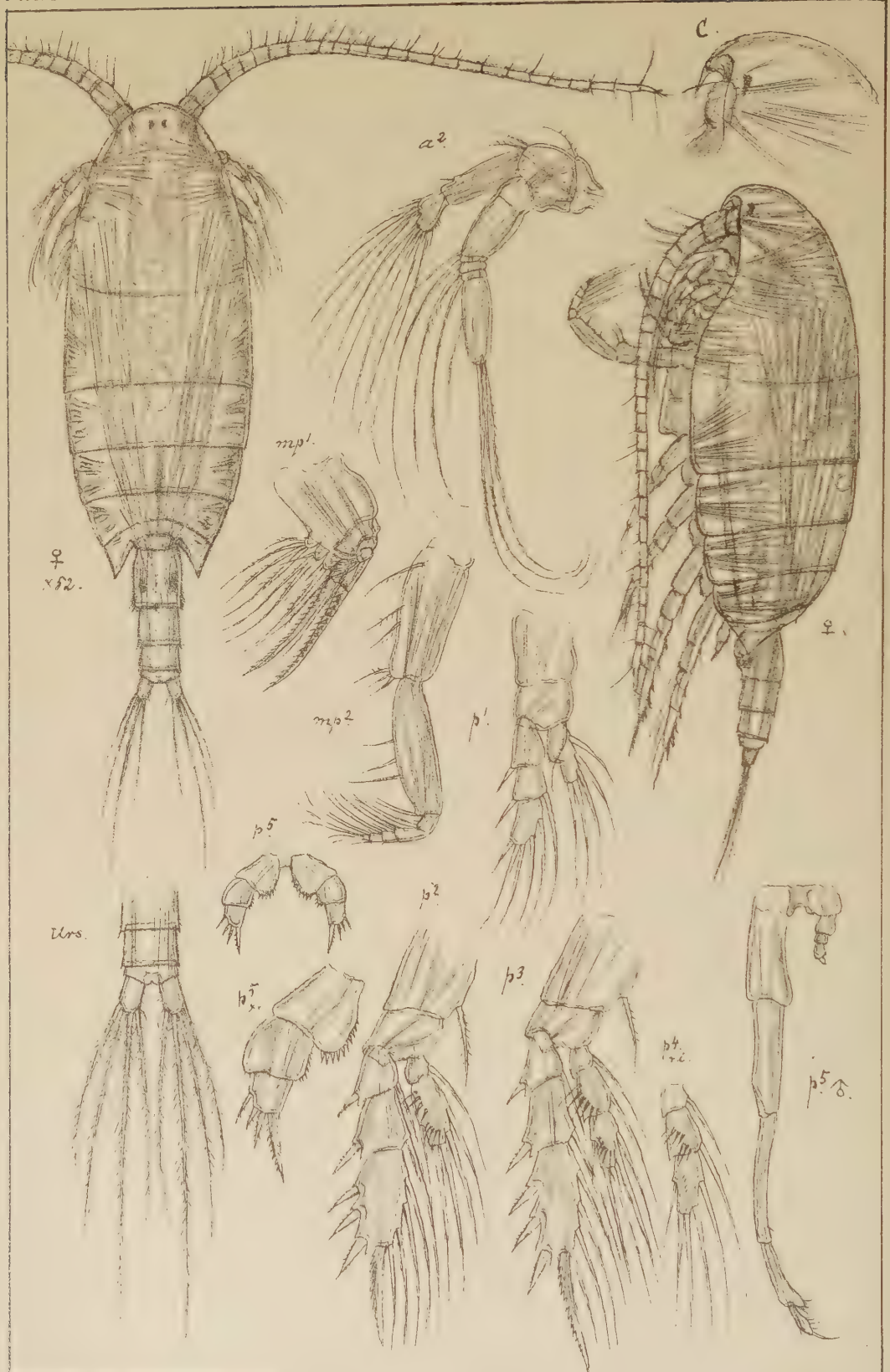
Heterarthrandria.

This section comprises the greater number of the hitherto known Calanoids, and among them are some of the most highly organized forms. Whereas the 2 preceding sections only contain marine forms, the present one is represented both in the sea and in inland-lakes and ditches; some forms being also found in more or less brackish water. The name of the section refers to the very dissimilar appearance of the 2 anterior antennæ in the male, one of them being much of same structure as in the female, whereas the other, as a rule the right one, is peculiarly transformed, constituting a powerful grasping organ, by the aid of which the female is seized during copulation. This prehensile antennæ exhibits beyond the middle a very movable articulation, which admits the terminal part to be doubled back upon the adjoining part, the latter being, as a rule, greatly tumefied and traversed by a strong muscle, which acts upon the terminal part. Thereby the said antenna becomes, as it were, divided into 3 successive sections generally well defined from each other: a basal, a median, and a terminal one. More rarely the geniculate character is less pronounced, for instance in the genus *Acartia*; but in the far greater number of forms it is very conspicuous, so as at once to make these Calanoids recognizable from those belonging to the 2 preceding sections. The 5th pair of legs are always present in both sexes, though in the female they may be much reduced in size. In some cases these legs are natatory, like the preceding pairs; but in the male the outer ramus is always somewhat transformed, and at any rate in one of the legs, generally the right one, pronouncedly prehensile in structure. No difference whatever is found in the structure of the oral parts in the two sexes, and, on the whole, the genera

Copepoda
Calanoida.

Phaënnidæ

Pl. XXXIII.



G. O. Sars autogr

Trykt i den private Opmaaling, Chra

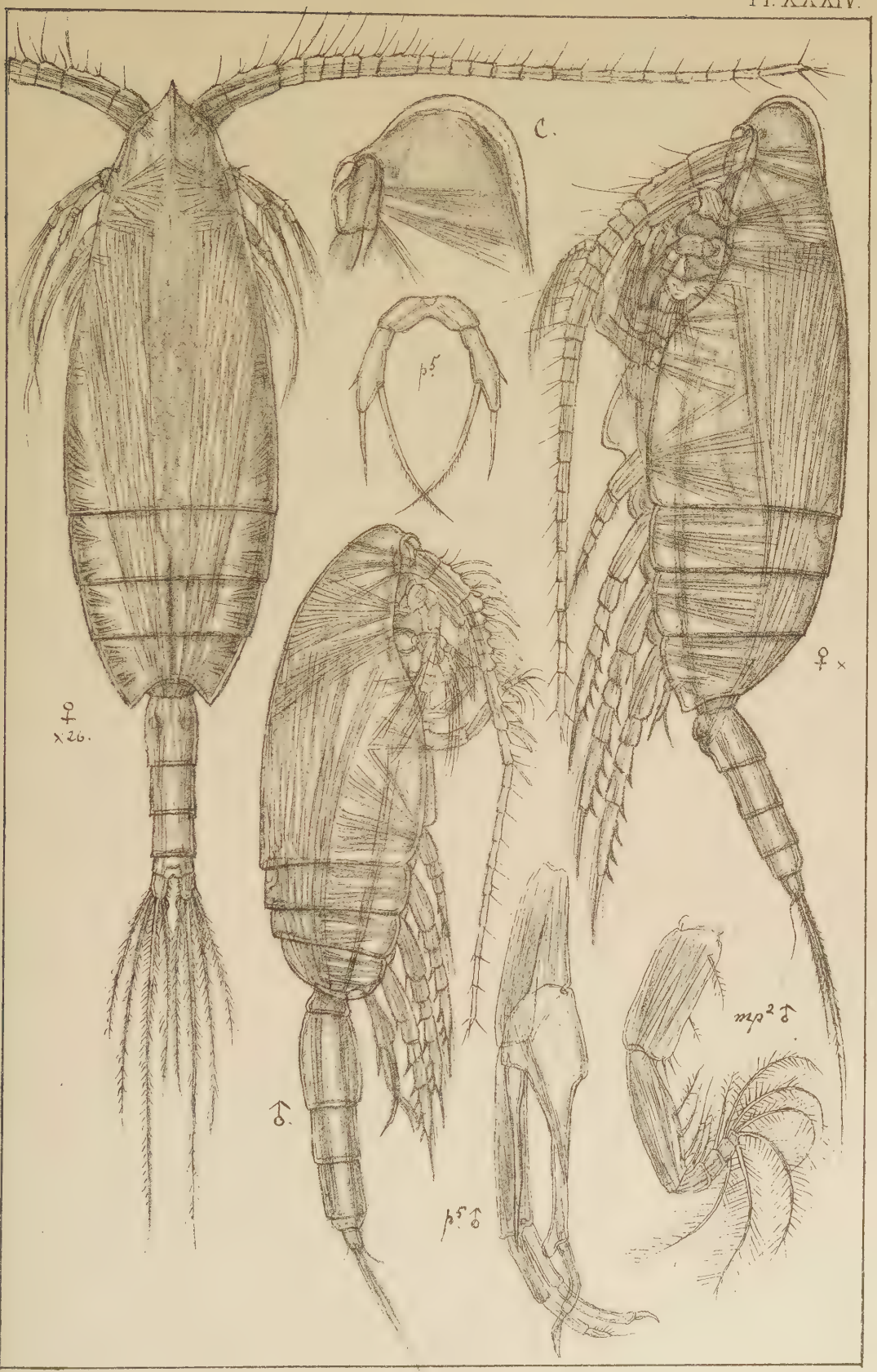
Xanthocalanus propinqvus. G. O. Sars

Copepoda

Calanoida.

Scolecithricidæ

PI. XXXIV.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra.

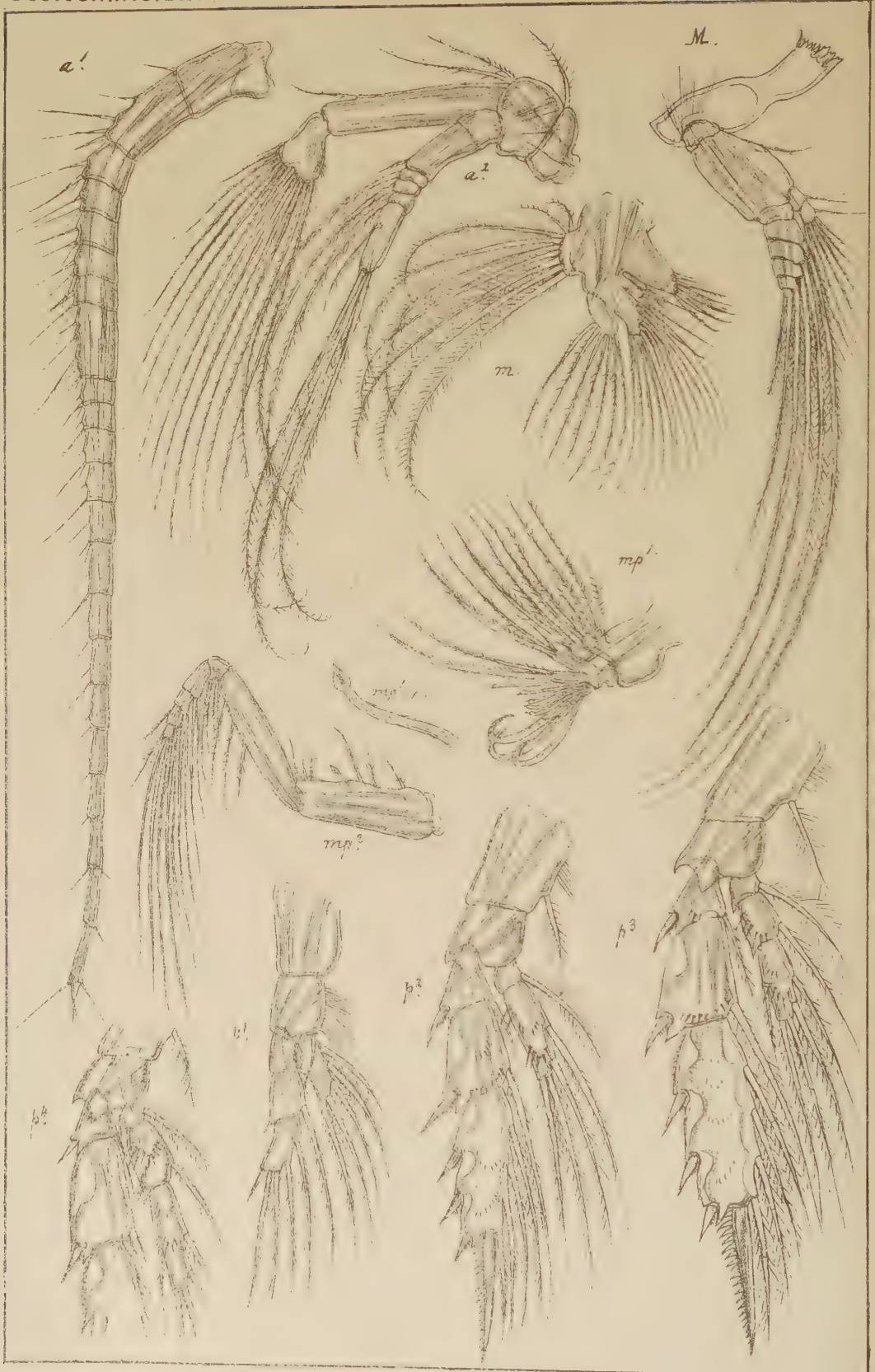
Amallophora magna, Scott

Copepoda

Calanoida.

Scolecithricidæ

PI XXXV



G O Sars autogr.

Trykt i den private Opmaaling, Chra.

Amallophora magna, Scott
(continued)

Copepoda

Calanoida.

Scolecithricidæ

PI. XXXVI

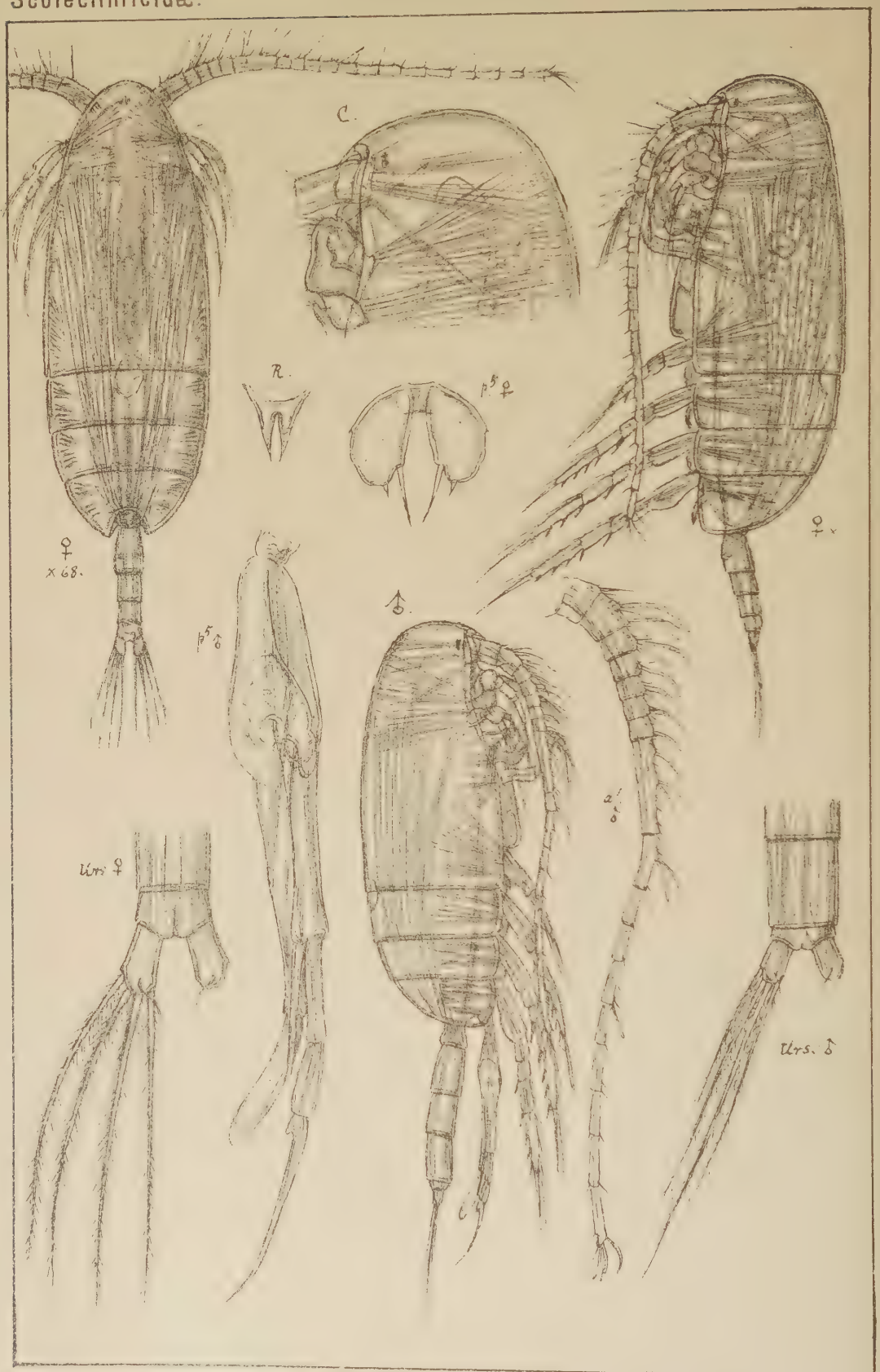
G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Amallophora brevicornis, G.O.Sars.

Copepoda
Calanoida

Scolecithricidæ. PI. XXXVII

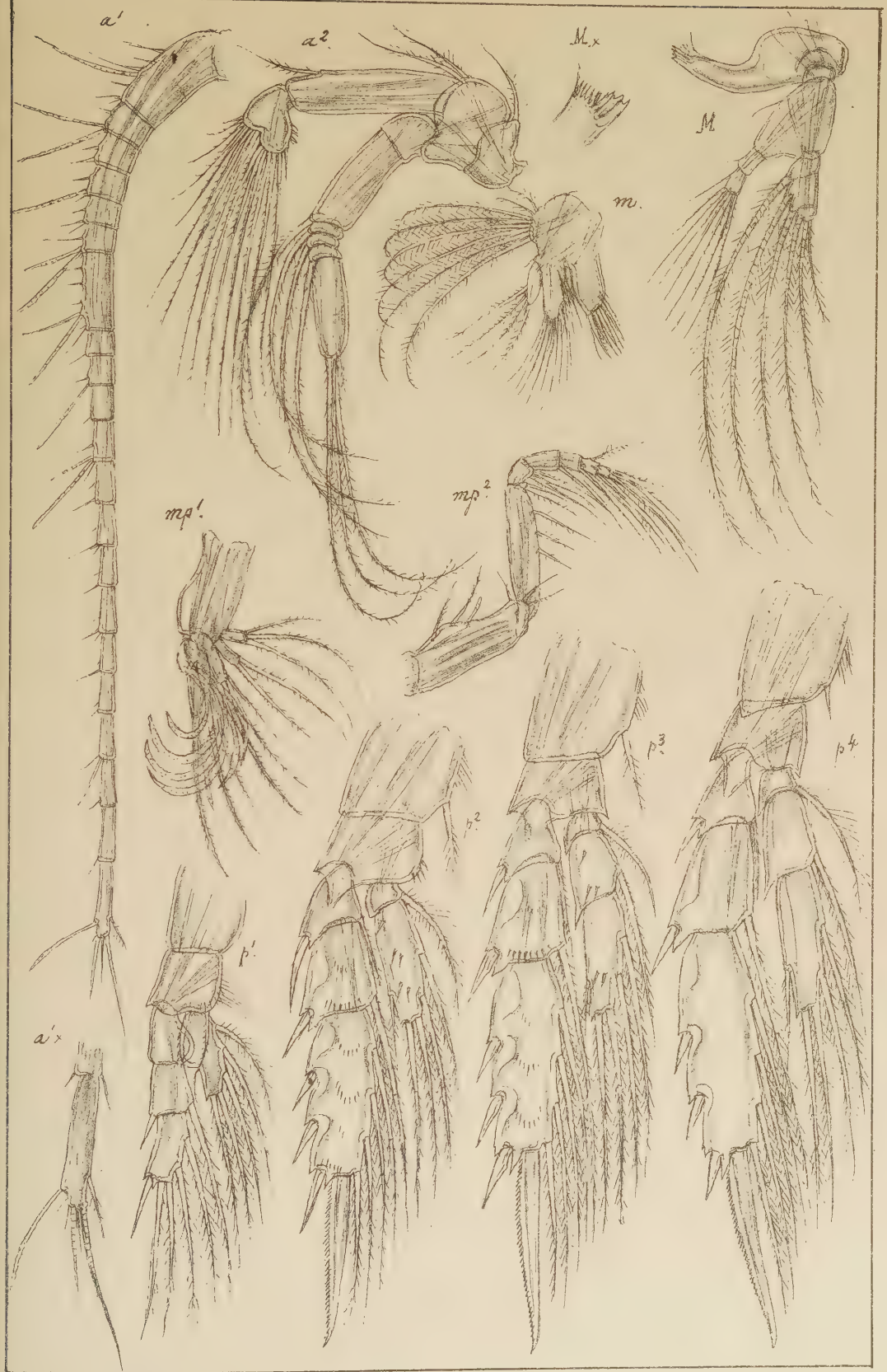


G O. Sars autogr.

Trykt i den private Opmaaling, Chra.

Scolecithricella minor (Brady.)

Copepoda
Calanoida.



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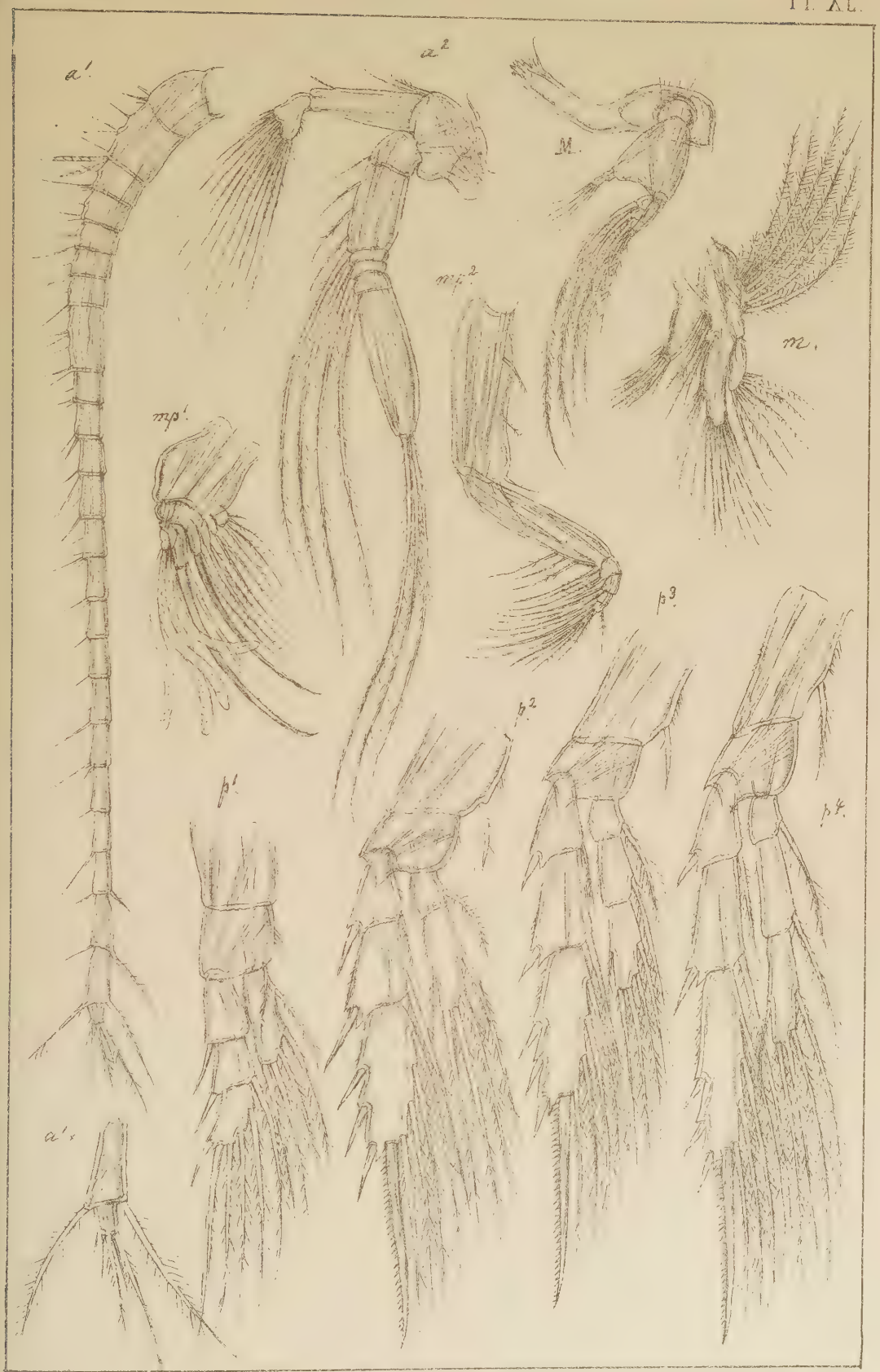
Scolecithricella minor (Brady.)
(continued.)

Copepoda
Calanoida.

Trykt i den private Opmaaling, Chra.

Diaixis hibernica (Scott.)

Copepoda
Calanoida.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

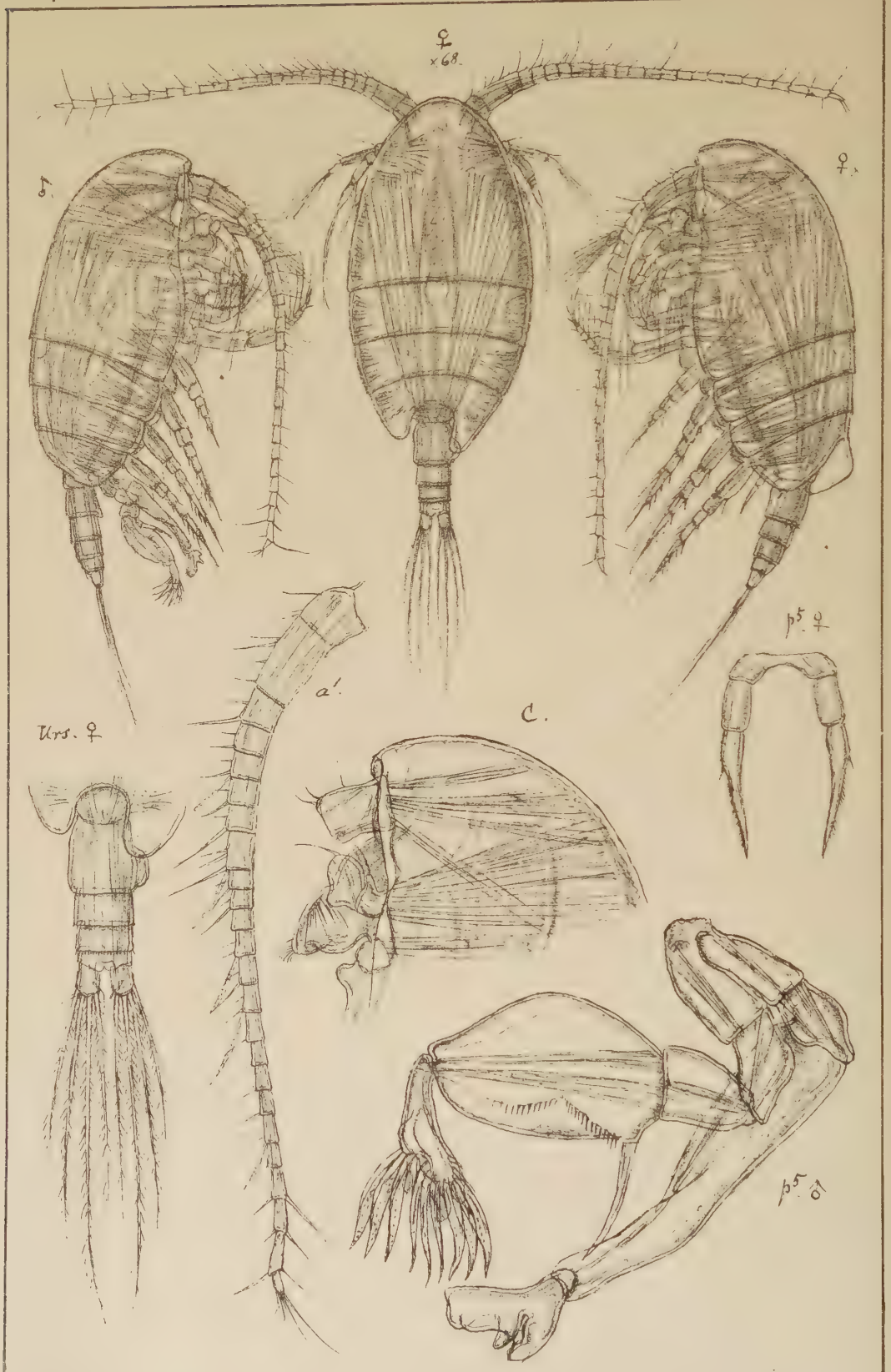
Diaixis hibernica (Scott.)
(continued.)

Copepoda

Calanoida

Stephidæ

Pl. XLI

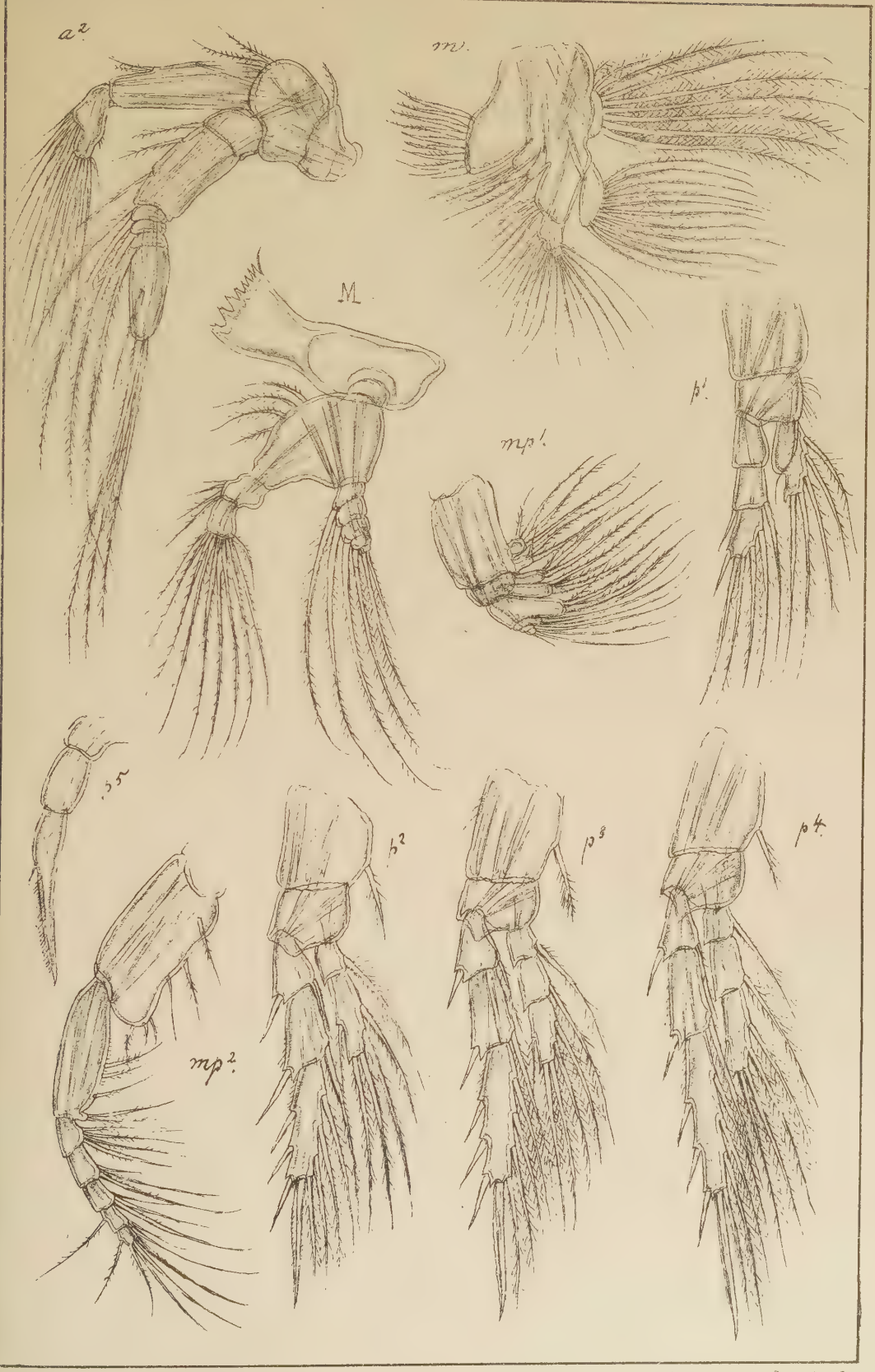


G. O. Sars autogr.

Stephos lamellatus. G. O. Sars.

Trykt i den private Opmaaling, Chra

Copepoda
Calanoida

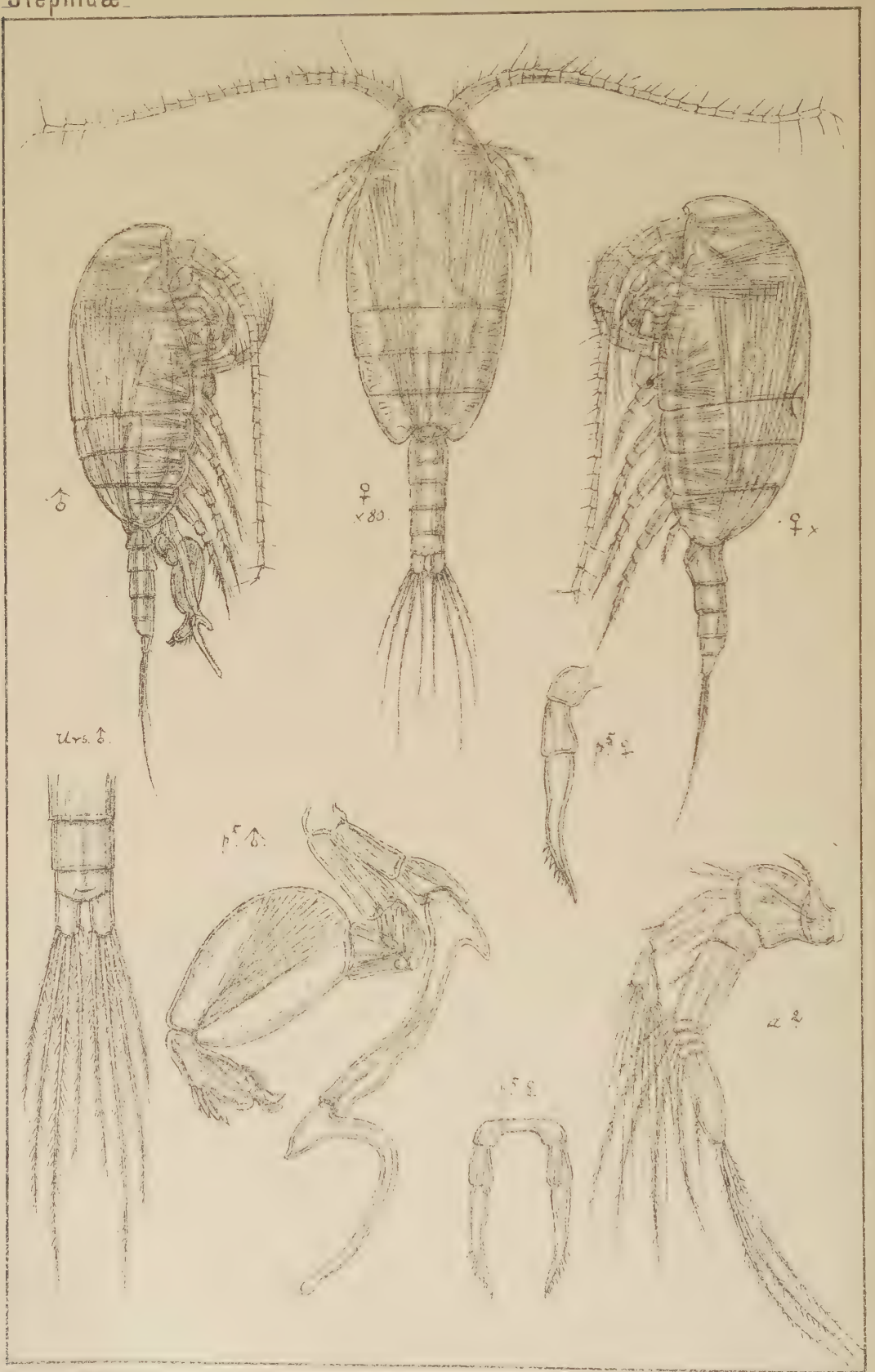


G. O. Sars autogr.

Forfatterretsligt beskyttet. Det Kgl. Norske Videnskabers Selskab.

Stephos lamellatus G. O. Sars.
(continued)

Copepoda
Calanoida



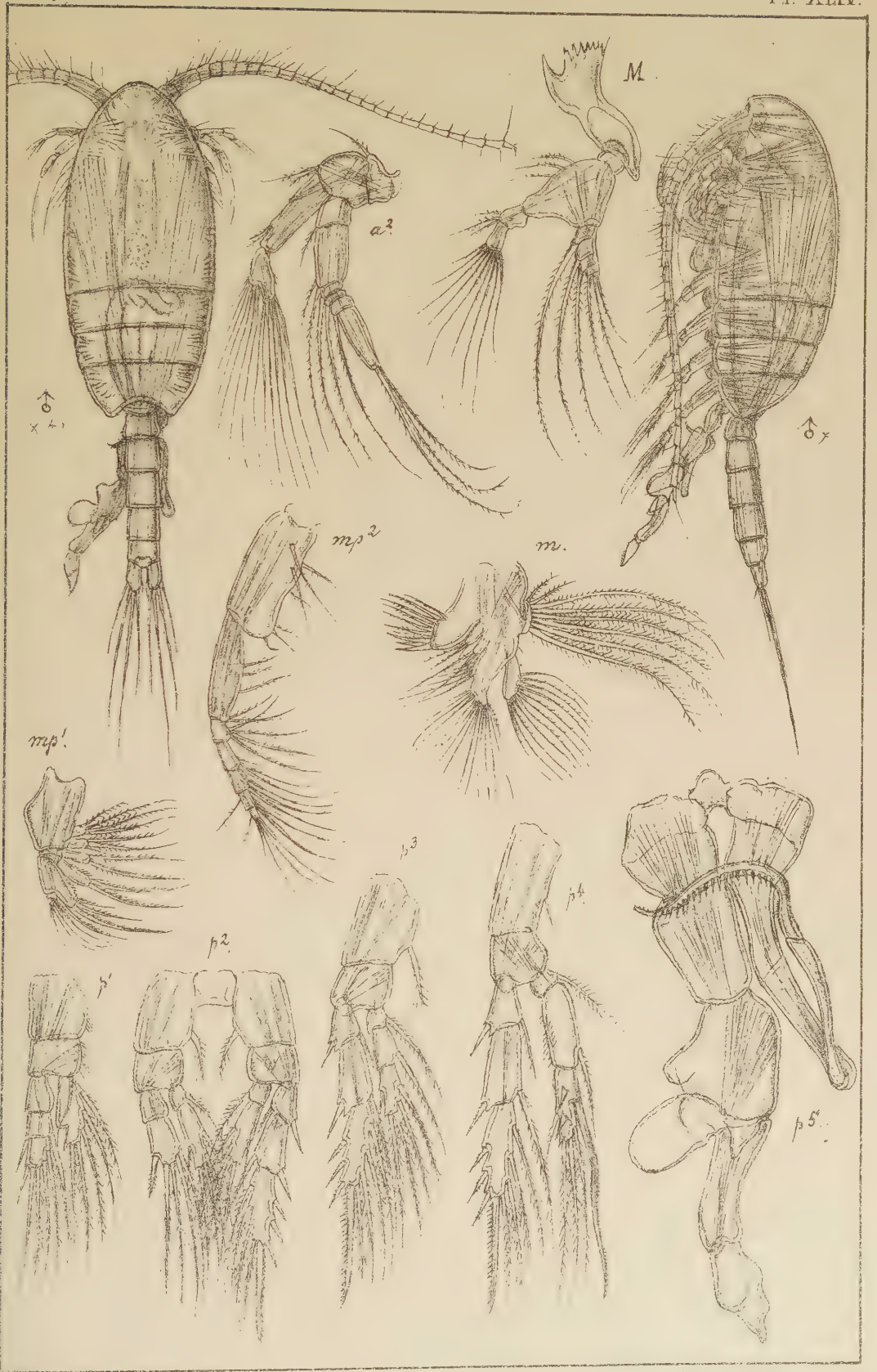
Stephos Scotti G. O. Sars.

Copepoda

Calanoida.

Stephidæ

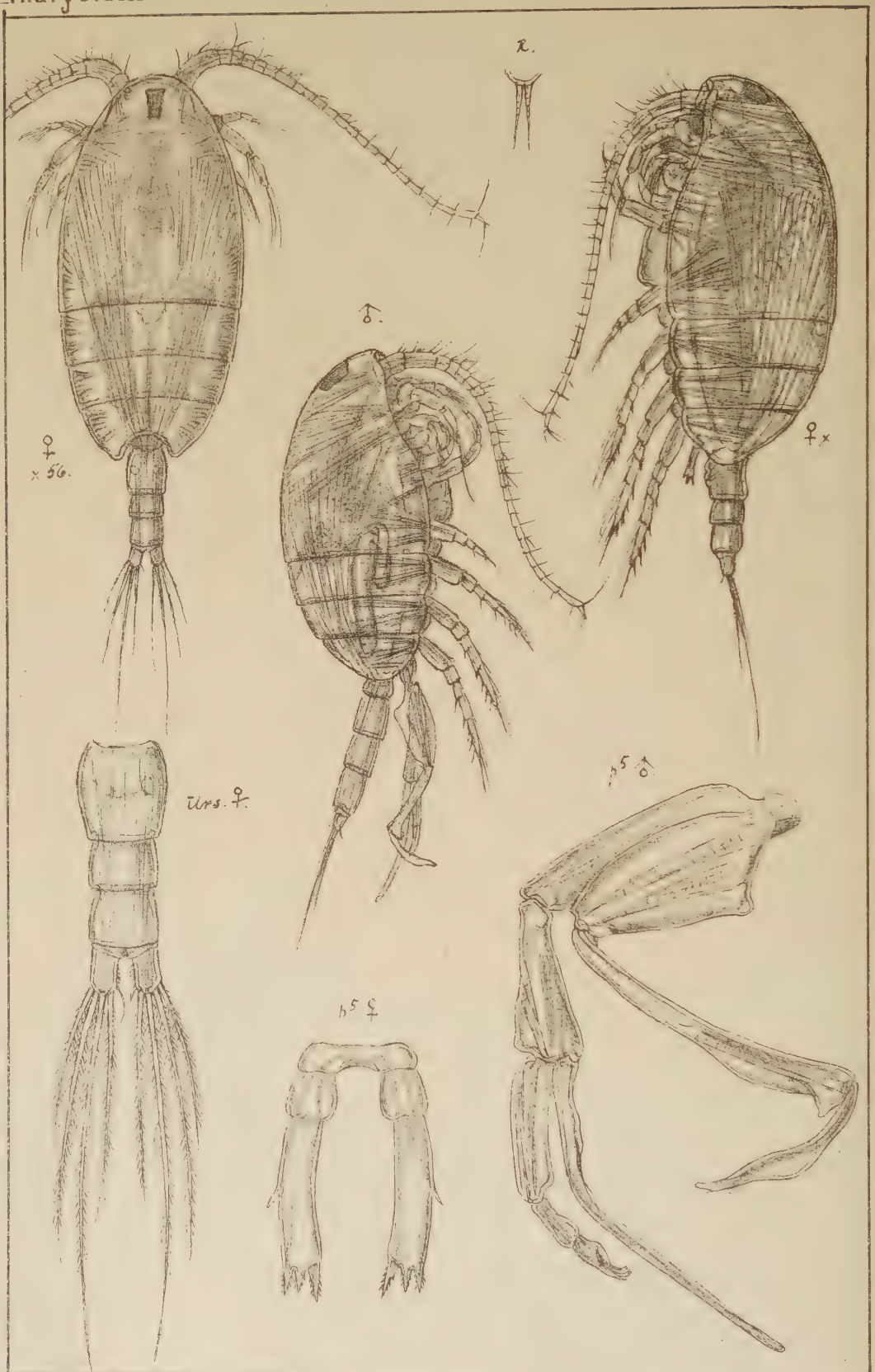
PI. XLIV.



Parastephos pallidus G. O. Sars.

Copepoda

Calanoida.



G O Sars autogr

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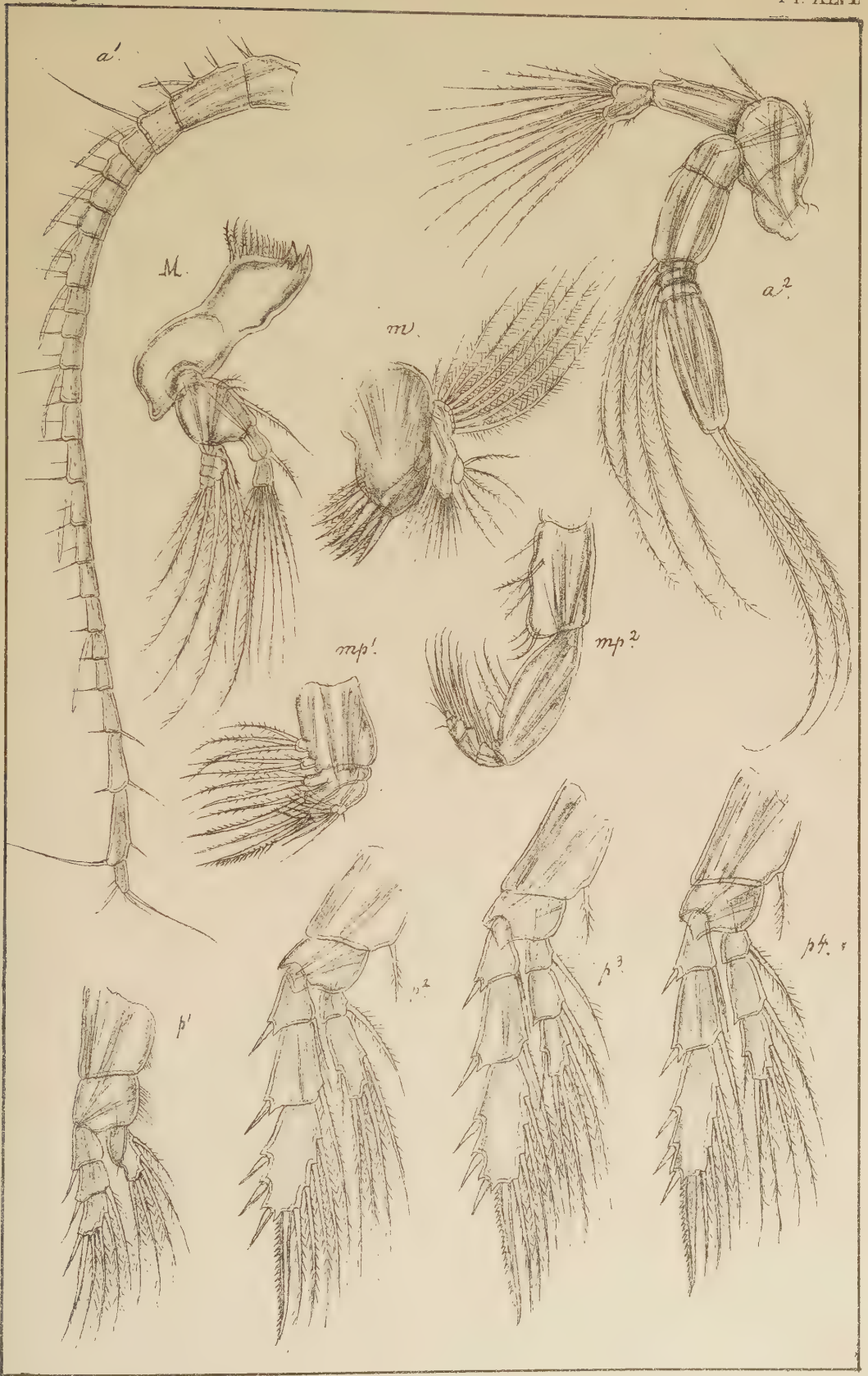
Tharybis macrophthalma G. O. Sars.

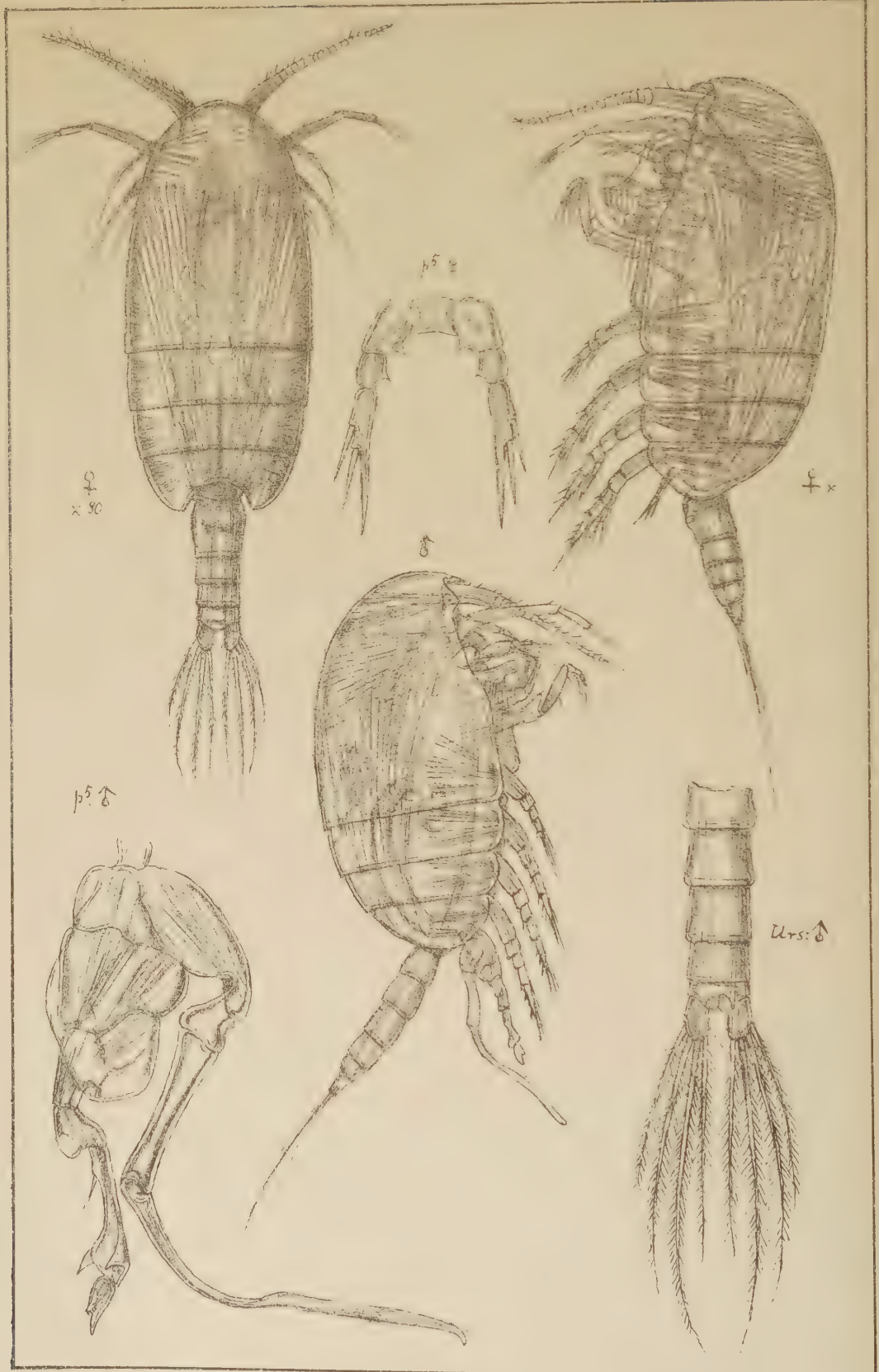


G. O. Sars autogr.

Trykt i den private Opmaaling, Chra

Tharybis macrophthalma G. O. Sars.
(continued.)

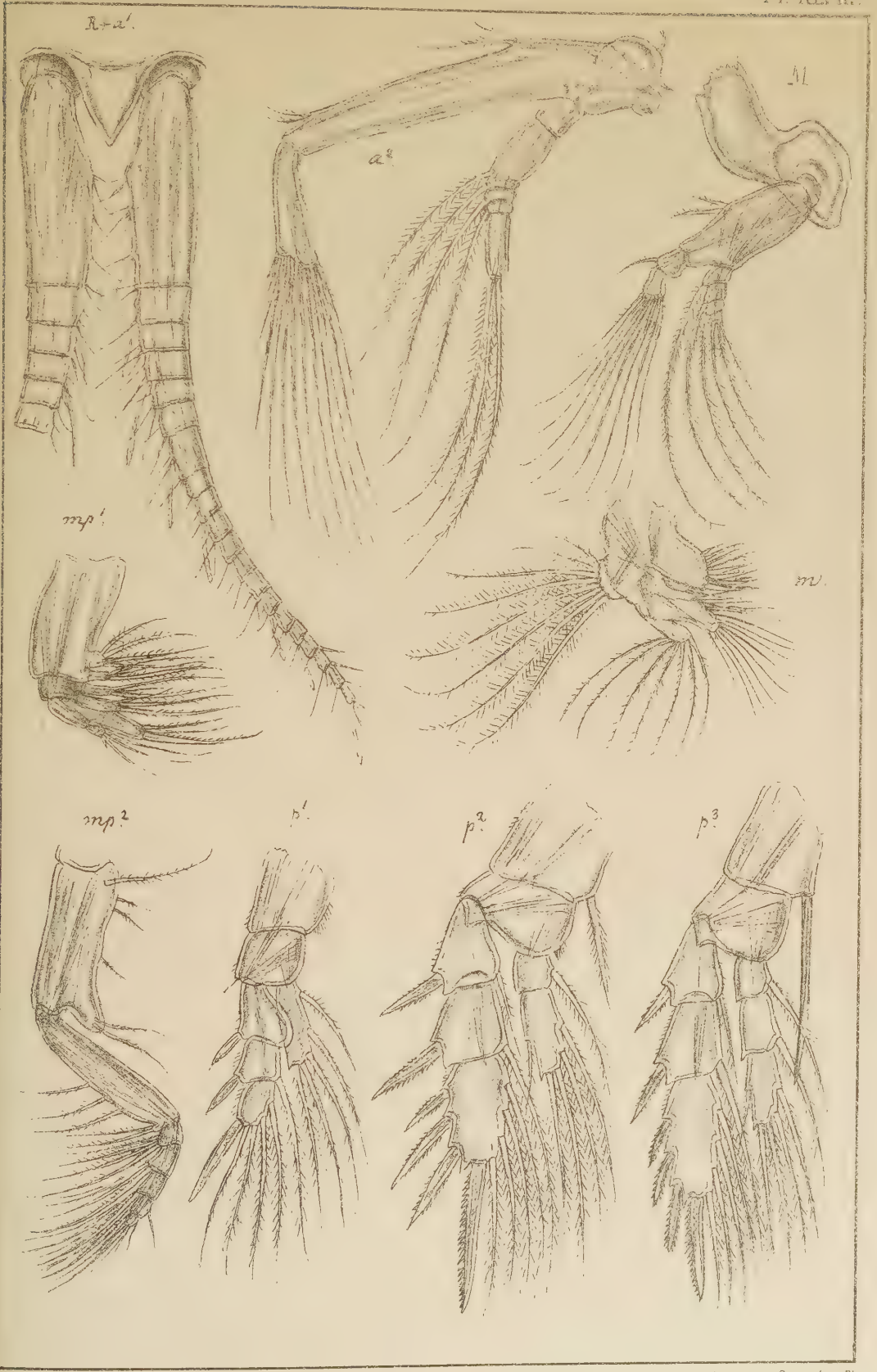
Copepoda



G.O. Sars autogr

Trykt i den private Opmaaling, Chra

Pseudocyclopia stephoides, Thomps



G.O. Sars autogr. Trykt i den private Opmaaling, Chra

Pseudocyclopia stephoides, Thomps
(continued.)

habitus does not exhibit such great sexual dissimilarity as is often met with in the *Amphascandria*. The males, moreover, occur in about the same number as the females, whereas in the above-mentioned section, male specimens are, as a rule, very rare, and apparently confined to certain seasons.

The subdivision of this section is connected with no small difficulty, owing to the great variation in the structure of the several appendages. In his great work, Dr. Giesbrecht only records 3 families belonging to this section, viz., the *Centropagidæ*, the *Candacidæ* and the *Pontellidæ*, the first being subdivided into 4, and the last into 2 subfamilies. According to the plan followed in the present account, these subfamilies are here raised to the rank of true families, and their number has moreover been considerably increased. I think we must at any rate admit the following 14 families: *Centropagidæ, Diaptomidæ, Pseudodiaptomidæ, Lucicutiidæ, Temoridæ, Metridiidæ, Heterorhabdidæ, Arietellidæ, Candaciidæ, Pontellidæ, Parapontellidæ, Acartiidæ, Tortanidæ, Pseudocyclopidæ.* With the exception of the *Pseudodiaptomidæ*[1]), the *Lucicutiidæ*[2]) and the *Tortanidæ*[3]), all these families are represented in the fauna of Norway, and they will be mentioned in the following pages, short diagnoses being given of each of them.

Fam. 13. Centropagidæ.

Characters.—Cephalosome well defined from the 1st pedigerous segment, front with 2, generally soft appendages below. Last 2 segments of metasome likewise, as a rule, well defined. Urosome consisting in female of 3, in male of 4 or 5 segments; caudal rami more or less elongated, with the full number of setæ. Anterior antennæ consisting in female of 24 or 25 articulations; right antenna in male distinctly geniculate. Posterior antennæ and oral parts on the whole normal. The 4 anterior pairs of legs with both rami 3-articulate. Last pair of legs in female biramous, natatory, outer ramus with a strong unguiform

[1]) In this family, I propose to include the 2 genera *Pseudodiaptomus*, Herrick, and *Poppella*, Richard, which are undoubtedly nearly related, and together form a natural group somewhat intermediate between the *Diaptomidæ* and the *Temoridæ*.

[2]) This family, answering to the sub-family *Leuckartiinæ* of Giesbrecht, contains the following 3 genera: *Lucicutia*, Giesbr., *Isochæta*, Giesbr., and *Disseta*, Giesbr.

[3]) This family is established to include the 2 anomalous genera, *Tortanus*, Giesbr. (= Corynura Brady) and *Mormonilla*, Giesbr.

projection issuing from inside the 2nd joint; those in male with the outer rami more or less transformed and dissimilar, that of right leg, as a rule, the stronger.

Remarks.—In the restriction here adopted, this family is chiefly characterised by the structure of the legs, the 4 anterior pairs having both rami 3-articulate, and the last pair, at any rate in the female, being natatory, like the preceding pairs. The strong unguiform projection always found inside the outer ramus of the last pair of legs in the female is also very characteristic. The family comprises as yet 5 genera, viz., *Centropages,* Kröyer, *Isias,* Boeck, *Limnocalanus,* G. O. Sars, *Osphranticum,* Forbes, and *Boeckella,* Thomson. Of these genera, the first 2 are exclusively marine, whereas the other 3 are chiefly peculiar to fresh water. The first-named 3 genera are represented in the fauna of Norway, and will be treated of below.

Gen. 20. **Centropages,** Kröyer, 1848.

Syn: *Ichtyophorba,* Lilljeborg.

Generic Characters.—Body moderately slender, with the cephalosome somewhat contracted in front, and having a well-marked cervical depression dorsally; rostral appendages in some cases transformed to rigid spikes. Last segment of metasome distinctly defined from the preceding segment, and having the lateral parts, as a rule, expanded and acutely produced. Urosome in female more or less asymmetrical, in male generally composed of only 4 segments. Caudal rami of moderate length, with the setæ comparatively short. Eye well developed, subventral, and generally forming a distinct bulging below. Anterior antennæ very slender, consisting in female of 24 articulations, the last 2 joints being coalesced. Posterior antennæ with the outer ramus longer than the inner, and 6-articulate. Anterior maxillipeds with the distal setæ remarkably elongated, almost claw-like. Terminal joint of outer ramus in the 3 middle pairs of legs with 3 spines outside. Last pair of legs with the inner ramus well developed in both sexes and 3-articulate; outer ramus of left leg in male biarticulate, that of right leg 3-articulate, the last 2 joints forming together a powerful chela. No ovisac present in female.

Remarks.—This genus was established as early as the year 1848 by Kröyer, to include 2 species found by him, the one in the Atlantic Ocean, the other off the coast of Chili. As first shown by Boeck, the genus *Ichtyophorba*

of Lilljeborg is unquestionably identical with Kröyer's genus. The chief distinguishing character of this genus consists in the structure of the last pair of legs, the powerful chela formed by the outer ramus of the right leg in the male being especially very characteristic. We know at present about 13 species of this genus, occurring in different parts of the Oceans. All these species are marine and pelagic in their habits, sometimes occurring in great shoals close to the surface of the sea. Two of the species belong to the fauna of Norway, and will be described below.

30. Centropages typicus, Kröyer.

(Pl. XLIX, L, LI).

Centropages typicus, Kröyer. Nat. Tidsskr. New series, Vol. 2, p. 588, Pl. VI, figs. 22—26.

Syn: *Ichtyophorba denticornis*, Claus.

Specific Characters.—Female. Anterior division of body somewhat depressed, seen dorsally, oblong oval in form, greatest width considerably exceeding $^1/_3$ of the length, anterior extremity conspicuously contracted, posterior scarcely at all attenuated. Cephalosome less distinctly separated laterally from the 1st pedigerous segment, front projecting below into 2 rigid, deflexed spikes. Last segment of metasome with the lateral parts considerably expanded, and projecting at the outer corner into a strong spiniform projection pointing obliquely backwards, and somewhat more extant on right than on left side. Urosome conspicuously asymmetrical, and generally turned more or less to left side, genital segment scarcely longer, and but slightly broader, than the succeeding segment, and carrying near the hind edge 4 somewhat irregularly arranged slender spines, 2 subventral and 2 subdorsal, the latter distinctly denticulate; middle segment with a slight knob-like protuberance on the right side; last segment comparatively short. Caudal rami about twice as long as they are broad, and slightly widening distally, being somewhat divergent and finely ciliated inside; innermost but one of the apical setæ nearly twice as long as the others. Eye forming a very conspicuous bulging below. Anterior antennæ, when reflexed, reaching to about the tip of the caudal rami, 1st, 2nd and 5th articulations each produced in front to a well-developed dentiform projection. Outer ramus of last pair of legs with the unguiform projection of the middle joint very strong, equalling in length the terminal joint.

Male somewhat more slender than female, and having the lateral expansions of last pedigerous segment less divergent, and conspicuously asymmetrical, the left one being much larger than the right. Urosome perfectly symmetrical and rather slender, composed of 4 segments only. Caudal rami somewhat longer than in female, with the outermost seta quite short and spiniform, without cilia.

Right anterior antenna with the middle section rather tumefied, its antepenultimate joint having a strong denticle in the middle of the anterior edge. Chela of last pair of legs very powerful, thumb strongly developed, of about the same length as the dactylus, and unguiformly incurved at the tip.

Colour. Body in both sexes rather pellucid, in female being often tinged with orange or light chestnut in the middle of the anterior division.

Length of adult female reaching 1.75 mm., of male 1.60 mm.

Remarks.—This handsome species was first described by Kröyer under the above name, and was subsequently recorded by Claus, who regarded it as new, and described it as *Ichtyophorba denticornis*. It is easily recognizable from the 2nd Norwegian species by the strong rostral spikes, the form of the lateral expansions of the last pedigerous segment, and that of the urosome in the female, and finally, by the conspicuous dentiform projections on the anterior antennæ, and the very powerful chela of the right last leg in the male.

Occurrence.—This form is found along the whole southern and western coast of Norway, at least up to the Trondhjem Fjord. On the other hand, I have never met with it in any of the numerous samples of plankton from the northern part of the Ocean examined by me, for which reason we are justified in regarding it as a true Atlantic form. Off the Norwegian coast it occurs both in the open sea and in the fjords, being often found in considerable abundance at the very surface of the sea. It moves rather rapidly in the usual manner, now using chiefly the posterior antennæ, now darting about in an abrupt, jerking manner by powerful strokes of the natatory legs and the urosome.

Distribution.—Off Cape Finisterre (Kröyer), coast of France (Canu), British Isles (Brady), Heligoland (Claus), Mediterranean (Giesbrecht), Atlantic Ocean from Lat. 6° S to Lat. 62° N (Cleve).

31. Centropages hamatus (Lilljeborg).

(Pl. LII).

Ichtyophorba hamata, Lilljeborg. De Crustaceis ex ordinibus tribus in Scania occurrentibus, p. 185, Pl. XXI, Pl. XXVI, figs 9—12.

Syn: *Ichtyophorba angustata*, Claus.

Specific Characters.—Female. Body comparatively more slender than in the preceding species, with the anterior division, seen dorsally, somewhat attenuated behind. Cephalosome well defined from the 1st pedigerous segment, front tipped below with 2 soft recurved filaments. Last segment of metasome with the lateral parts less expanded than in *C. typicus*, terminal spine shorter and

remarkably extant on right side. Genital segment slightly asymmetrical and considerably dilated in the middle, lateral edges finely ciliated, ventral face with a recurved spiniform process immediately in front of the genital orifice. The 2 succeeding segments of about equal size and considerably smaller than the genital segment. Caudal rami sublinear in form, about 3 times as long as they are broad, apical setæ more elongated than in *C. typicus*. Anterior antennæ, when reflexed, reaching to the end of the caudal rami, none of the articulations with dentiform projections. Legs comparatively more slender than in the type species, with the terminal spine of outer ramus more coarsely denticulate. Last pair of legs with the unguiform process much shorter than in that species.

Male still more slender than female, and having the lateral parts of last pedigerous segment but slightly expanded and nearly symmetrical. Urosome fully equalling half the length of the anterior division, though, as in the preceding species, composed of only 4 segments. Caudal rami comparatively longer than in female, outermost seta not transformed. Right anterior antennæ with the middle section less tumefied than in the type species, and without any dentiform projection of the antepenultimate joint. Chela of right last leg less powerfully developed, thumb simple spiniform, and shorter than the dactylus.

Colour. Body in both sexes highly pellucid and nearly colourless.

Length of adult female reaching 1.35 mm., of male 1.30 mm.

Remarks.—This form was described by Prof. Lilljeborg in the year 1853 as *Ichtyophorba hamata,* the generic name referring to the significance of this Calanoid as fish-food, the specific name probably to the peculiar recurved process occurring below the genital segment in the female. The *Ichtyophorba angustata* of Claus is unquestionably indentical with Lilljeborg's species. It may be easily distinguished from *C. typicus* by its more slender body, the different form of the lateral parts of the last pedigerous segment and of the genital segment, the soft character of the frontal appendages, the total absence of denticles on the anterior antennæ, and, finally, by the less powerfully developed chela of the right last leg in the male. It is, moreover, rather inferior in size.

Occurrence.—The present Calanoid occurs in great abundance in the Christiania Fjord, even in the immediate neighbourhood of the town, and is also found pretty commonly along the whole southern and western coast of Norway, both in the fjords and in the open sea. North of the Trondhjem Fjord it becomes more scarce; but according to the statements of Dr. Aurivillius, it extends as far as the 70th degree of latitude. Like the preceding species, it is a true pelagic form, occurring, as a rule, close to the surface of the sea, and it no doubt forms

an essential part of the food of several pelagic fishes, for instance the herring and the mackerel.

Distribution.—Coast of France (Canu), British Isles (Brady), Heligoland (Claus), Kattegat (Lilljeborg), the Baltic (Nordqvist), Atlantic Ocean from Lat. 41° to 66° N (Cleve).

Gen. 21. **Isias,** Boeck, 1864.

Generic Characters.—Body moderately slender, with the anterior division somewhat tumid and much vaulted above. Cephalosome well defined from the 1st pedigerous segment, but without any distinct cervical depression, front carrying below 2 very delicate, recurved tentacular filaments. Last segment of metasome confluent with the preceding one, and not expanded laterally. Urosome comparatively slender, especially in male, where it consists of 5 distinct segments, the middle one conspicuously asymmetrical. Caudal rami elongated. Eye rather large, though not protuberant below. Anterior antennæ not much elongated, otherwise of a structure similar to that in *Centropages*. Posterior antennæ likewise rather similar. Anterior lip with the median lobe remarkably prominent. Anterior maxillipeds less powerfully developed than in *Centropages*, and having the distal setæ not prolonged. Oral parts otherwise resembling in structure those in the above genus. Legs comparatively robust, the 3 middle pairs with the 2nd basal joint of a somewhat unusual appearance, being obliquely oval in form; terminal joint of outer ramus in these pairs with 3 spines outside. Last pair of legs in female with the inner ramus very small, uniarticulate; unguiform projection of outer ramus well marked, though rather short; those in male with the inner ramus obsolete on right side, outer ramus of both legs biarticulate, with the distal joint spatulate in form and considerably larger on the right leg. No ovisac present in female.

Remarks.—This genus, established by Boeck, was placed by Dr. Giesbrecht in his subfamily *Temorinæ*, the subfamily *Centropaginæ* only comprising the genus *Centropages*. This arrangement cannot, I think, be admitted, since the present genus in reality exhibits a much closer relation to *Centropages* than to any of the genera comprised within the subfamily *Temorinæ*, the structure of the last pair of legs especially seeming to bring it nearer to that genus. We do not know at present more than a single species belonging to the present genus.

32. Isias clavipes, Boeck.

(Pl. LIII, LIV).

Isias clavipes, Boeck. Oversigt over de ved Norges Kyster iagttagne Copepoder. Chr. Vid. Selsk. Forh. 1864, p. 242.

Syn: *Isias Bonnieri*, Canu.

Specific Characters.—Female. Anterior division of body, seen dorsally, regularly elliptical in outline, greatest width about equalling half the length, and occurring in the middle, anterior extremity narrowly rounded, posterior somewhat blunted; seen laterally, considerably vaulted above. Lateral parts of last segment of metasome rounded off. Urosome exceeding half the length of the anterior division, and slightly asymmetrical, genital segment somewhat tortuous, with a rounded protuberance to the left side of the dorsal face, and carrying below 2 somewhat unequal spiniform, recurved processes, one on each side of the genital area. Caudal rami sublinear in form, being nearly 4 times as long as they are broad, apical setæ not much elongated. Anterior antennæ, when reflexed, scarcely reaching beyond the anterior division, some of the anterior bristles on the proximal part spiniform. Last pair of legs with a strong spine on the hind face of the 2nd basal joint issuing near the outer corner, inner ramus very small, with 3 or 4 natatory setæ; unguiform projection of outer ramus somewhat curved and distinctly denticulated.

Male more slender than female, with the urosome longer and narrower, middle segment produced on right side to a very conspicuous conical projection pointing straight outwards. Right anterior antenna with the middle section moderately tumefied. Last pair of legs with the inner ramus on right side obsolete, on left transformed to a somewhat irregularly folded lamella without any setæ; distal joint of outer rami with 4 marginal spines, that of right leg much the larger and of oval quadrangular form, with an irregular protuberance at the base inside, and with the outermost spine very strong; that of left leg with the inner edge finely ciliated and angularly produced both at the base and at the end.

Colour. Body, as a rule, semipellucid and of whitish colour, sometimes, however, in female exhibiting a light bluish hue.

Length of adult female reaching 1.35 mm., of male about the same.

Remarks.—As observed above, this is the only species of the genus as yet known, the form described by Mr. E. Canu as *Isias Bonnieri* being unquestionably identical with Boeck's species. It may be easily recognized by the general form of the body, the comparatively short anterior antennæ, and the peculiar structure of the last pair of legs, especially in the male.

Occurrence.—Boeck observed this form at Karmö, west coast of Norway. I have myself met with it in several localities both on the south and west coasts, from the Christiania Fjord northwards at least to the Trondhjem Fjord. In none of these localities did it occur, however, in any abundance. In habits it seems to be less pronouncedly pelagic than the species of *Centropages*, being sometimes found close to the shore among algæ. On the other hand, I have never found it in any of the samples of plankton taken in the open sea. Yet it cannot properly be considered as a true bottom-form, as I have found it occasionally, for instance, at the Zoological Station at Dröbak, close to the surface of the sea.

Distribution.—Mediterranean (Giesbrecht), coast of France (Canu), British Isles (Brady), Atlantic Ocean between Lat. 36° and 60° N. (Giesbrecht).

Gen. 22. **Limnocalanus**, G. O. Sars, 1863.

Generic Characters.—Form of body slender and elongated. Cephalosome well defined from the 1st pedigerous segment; front with 2 very small soft appendages below. Last segment of metasome likewise distinctly defined from the preceding one, its lateral parts not expanded. Urosome slender, 3-articulate in female, 5-articulate in male. Caudal rami narrow linear, with the appendicular bristle rather elongated. Eye small, subventral. Anterior antennæ slender, consisting in female of 25 articulations, last joint well defined, but very small; right anterior antenna in male geniculate. Posterior antennæ with both rami slender, the outer one the longer and distinctly 7-articulate. Mandibles with the masticatory part considerably expanded, the 2 outer denticles of the cutting edge simple, unguiform, palp comparatively narrow, with the inner ramus reflexed. Maxillæ quite normal. Anterior maxillipeds powerfully developed, with the distal appendages transformed to long, claw-like spines. Posterior maxillipeds unusually elongated. Legs slender, with the 2nd basal joint rather elongated, inner ramus in all pairs 3-articulate, terminal joint of outer ramus with only 2 spines outside. Last pair of legs in female with the unguiform projection of the outer ramus well marked; those in male with the outer rami biarticulate, distal joint of left leg oblong lamellar with 4 marginal spines, that of right leg somewhat club-shaped and produced inside to a long deflexed spiniform process. No ovisac present in female.

Remarks.—This genus was established by the present author as early as the year 1863, to include a peculiar fresh-water Calanoid found in the largest Norwegian lake, Mjösen. The name refers to the habits of this Calanoid, which somewhat recall those of the marine *Calani*. It is, however, in reality very different, as proved by the structure of the several appendages, and it does not even belong to the same section. In the slender form of the body and the narrow elongated caudal rami, the species of this genus resemble some of the *Temoridæ*, especially the genus *Temorella* of Claus; but the structure of the last pair of legs is very different, and exhibits a much closer resemblance to that in the genus *Centropages*. Indeed, one of the species was on this account referred to that genus by M. de Guerne. There are, however, sufficient reasons for keeping the present genus apart, though it must undoubtedly have a place in the family *Centropagidæ*, as here defined. We know at present of 3 different species belonging to this genus, viz., *L. macrurus*, G. O. Sars, *L. Grimaldii*, de Guerne, and *L. sinensis*, Poppe. The first and last species have hitherto only been found in fresh-water lakes, whereas the 2nd is a more strictly marine form, though also occurring in the Caspian Sea. Only the first-named species belongs to the fauna of Norway.

33. Limnocalanus macrurus, G. O. Sars.

(Pl. LV, LVI).

Limnocalanus macrurus, G. O. Sars. Oversigt af de indenlandske Ferskvandscopepoder. Chr. Vid. Selsk. Forh. 1862, p. 17.

Specific Characters.—Female. Anterior division of body, seen dorsally, narrowly elliptical in outline, greatest width but slightly exceeding $^1/_3$ of the length, anterior extremity narrowly rounded, posterior somewhat contracted; seen laterally only very slightly vaulted above. Cephalosome with a very conspicuous cervical sinus, in front of which the dorsal margin is gibbously convex and declines obliquely to the short rostral protuberance. Urosome (including the caudal rami) exceeding the metasome in length, genital segment somewhat larger and thicker than the middle one, last segment the smallest. Caudal rami narrow linear and scarcely at all divergent, equalling in length the last 2 caudal segments combined, their dorsal face clothed with numerous small spikes; outermost seta shorter than the others, and issuing from the outer edge at some distance from the apical ones. Anterior antennæ, when reflexed, reaching about to the end of the middle caudal segment. Last pair of legs with the unguiform projection of outer ramus shorter than the terminal joint, and distinctly denticulate.

Male of about the same size as the female, and rather similar in appearance, though having the urosome narrower and divided into 5 well-defined segments. Right anterior antenna with the middle section but slightly tumefied. Last pair of legs with the outer rami very unequal, that of left leg much the longer, with the distal joint twice as long as the proximal one, that of right leg with the distal joint quite short, club-shaped, and carrying at the tip, outside the spiniform process, a very small bidentate piece (rudiment of a 3rd joint).

Colour. Body in both sexes highly pellucid and nearly hyaline, though, as a rule, exhibiting within the metasome a rather large oblong oil-bubble of a clear orange hue.

Length of adult female reaching 2.20 mm.; that of male about the same.

Remarks.—This form, which, being the first one described, may be regarded as the type of the genus, is very closely allied to the marine species, *L. Grimaldii* (de Guerne), with which it has been confounded by earlier authors. On a closer comparison, however, it is at once distinguished by the peculiar shape of the cephalosome, as seen laterally. Whereas in *L. Grimaldii* the dorsal margin of this part, as in most other Calanoids, forms an uninterrupted curve up to the rostral prominence, in the present form it is conspicuously insinuated in the middle, bulging out in front of the sinus almost in a gibbous manner, to join the rostral prominence in a very oblique curve, thus giving the frontal part of the body a very peculiar appearance. The size of the present form is also rather inferior to that of the marine species.

Occurrence.—I have found this form very abundantly in some of the larger Norwegian lakes, viz., Mjösen, Tyrifjord, Randsfjord, Storsjö and Femsjö. It did not occur in any of these lakes except at some distance from the margin, and, as a rule, not at the very surface of the water, but only at some depth below it. In all the specimens collected (during the summer months) a large orange-coloured oil-bubble was constantly found within the metasome, whereas the ovarial tubes appeared, as it were, skrunk, so as to be detected only with great difficulty. This circumstance, in connection with the fact that all the specimens taken were fully grown, seems to prove that the propagation of this form must be confined to a different season of the year, perhaps the winter. It has been conjectured that this Calanoid might more properly be regarded as a relict marine form, a supposition which, however, was chiefly based upon the erroneous confusion of the 2 nearly-allied species, *L. macrurus* and *L. Grimaldii*. I think, however, that we must admit a near genealogical relationship between these 2 forms, the former being in all probability a direct descendant of the latter, though at present it

ought to be regarded as specifically distinct. It may be worthy of note in this connection, that the present Calanoid is only found in the lowland lakes, never at a height of more than 130 feet above the level of the ocean.

Distribution.—The great lakes of Sweden (Lilljeborg), Finland, and Russia (Nordquist), as also those of North America (Forbes).

Fam. 14. Diaptomidæ.

Characters.—Cephalosome well defined from the 1st pedigerous segment, with a more or less distinct cervical depression above, front unarmed, or carrying below 2 soft appendages. Last segment of metasome with the lateral parts in female more or less expanded. Urosome comparatively short, consisting in female of 2 or 3 segments, in male of 5 segments. Caudal rami not much prolonged, and carrying the full number of setæ. Eye distinct, subventral. Anterior antennæ in female consisting of 25 articulations; right one in male distinctly geniculate. Posterior antennæ with the outer ramus generally longer than the inner, and distinctly 7-articulate. Oral parts on the whole normal. Posterior maxillipeds, however, in some cases exceedingly powerfully developed. Legs comparatively strongly built, inner ramus in 1st pair biarticulate, in the 3 succeeding pairs 3-articulate. Outer ramus of 1st pair of legs with the 2nd joint unarmed outside; terminal joint of this ramus in the 3 middle pairs comparatively short, with only a single spine outside. Last pair of legs in female not natatory, though distinctly biramous, inner ramus, however, very small and simple in structure, outer ramus, as a rule, 3-articulate, penultimate joint produced at the end inside to a strong claw-like projection, terminal joint very small, in some cases obsolete. Last pair of legs in male very asymmetrical, right leg much the larger, and carrying at the tip a slender, movable claw. Ovisac present in female.

Remarks.—In the restriction here adopted, this family is chiefly characterised by the structure of the legs, and especially of those of the last pair in both sexes, partly also by the shape of the urosome and the presence in the female of a well-developed ovisac. It comprises exclusively inland forms, occurring more generally in fresh-water lakes and ponds, but sometimes also in lakes

containing saline water; but no true marine forms have as yet been met with. We know at present of at least 2 distinct genera belonging to this family, viz., *Diaptomus*, Westwood, and *Paradiaptomus*, G. O. Sars[1]). Only the former genus is represented in the fauna of Norway.

Gen. 23. **Diaptomus**, Westwood, 1836.

Syn: *Glaucea*, Koch.
„ *Cyclopsina*, M.-Edw. (part).

Generic Characters.—Body more or less slender, with the anterior division evenly vaulted above. Cephalosome with a well-marked cervical depression at about the middle of the dorsal face, front tipped below with 2 soft appendages of comparatively small size. Last segment of metasome in female generally imperfectly separated from the preceding one, lateral parts more or less expanded, and, as a rule, biangular, with a small denticle at each corner. Urosome in female generally 3-articulate, genital segment much the largest, and more or less dilated in front, middle segment small and often imperfectly separated from the anal segment. Caudal rami not very large, with the setæ scarcely transformed in male. Anterior antennæ generally slender, their length in some cases exceeding that of the body. Posterior antennæ with the outer ramus considerably longer than the inner. Posterior maxillipeds of moderate size, terminal part 5-articulate with none of the setæ unguiform. Terminal joint of outer ramus in the 1st pair of legs with only a single spine outside. Last pair of legs in female with the terminal joint of the outer ramus generally distinct and carrying 2 apical spines, those in male of somewhat varying structure in the several species.

Remarks.—This genus was established by Westwood as early as in the year 1836. The name *Glaucea* of Koch seems to date from about the same year, but Westwood's name is that now generally accepted by carcinologists. The chief distinguishing characters from the nearly-allied genus *Paradiaptomus* consist in the presence of distinct, though small tentacular appendages to the front, the somewhat different structure of the urosome, the fuller development of the

[1]) As shown by the present author, this genus is identical with the genus *Broteas* of Lovén; but as the latter name had been appropriated in Zoology at an earlier date, that of *Paradiaptomus* ought to be restored, and according to the rules of priority, the name *Lovenula* recently proposed by Dr. Schmeil must cede to that given to the genus by the present author.

outer ramus of the posterior antennæ, the much less powerful structure of the posterior maxillipeds, the presence of only a single spine outside the terminal joint of the outer ramus in the 1st pair of legs, and finally, the somewhat different appearance of the last pair of legs in the female. The genus comprises a very great number of species from all parts of the world, amounting to about 80 in all. Some of these species are rather anomalous, and it is therefore very probable, that in future it will be found advisable to subdivide this genus into several distinct genera. The determination of the species is connected with no small difficulty, owing to the imperfect manner in which they have generally been illustrated, most authors having contented themselves with only figuring some anatomical details of each species, generally the last pair of legs in the two sexes. To the fauna of Norway belong 7 species, to be described below. Besides some detail-figures, I have given carefully drawn habitus-figures of both sexes of all these, hoping thus to make the Norwegian species at least easily determinable for students.

34. Diaptomus castor (Jurine).

(Pl. LVII, LVIII).

Monoculus castor, Jurine. Histoire des Monocles qui se trouvent aux environs de Genève, p. 50, Pl. IV, figs. 1, 6, Pl. V, figs. 1, 5, Pl. VI, figs. 1, 17.

Syn: *Glaucea rubens*, Koch.

Specific Characters.—Female. Body somewhat robust, with the anterior division, seen dorsally, oblong oval in outline, greatest width somewhat in front of the middle, and considerably exceeding $^1/_3$ of the length, anterior extremity obtusely rounded, posterior but slightly attenuated. Cervical depression very conspicuous. Lateral expansions of last pedigerous segment not very large, and divided into 2 acute lappets. Urosome distinctly 3-articulate, middle segment well defined, genital segment somewhat asymmetrical and considerably dilated, forming on each side a triangular expansion tipped with a short denticle, the right one somewhat larger than the left, and placed more posteriorly. Caudal rami comparatively short, about twice as long as they are broad. Anterior antennæ unusually short, when reflexed reaching but slightly beyond the anterior division of the body. Posterior maxillipeds more robust than in most other species, 2nd basal joint rather broad, terminal part much shorter than this joint, and having the anteriorly-curving setæ partly spiniform. Last pair of legs with a conspicuous triangular projection on the hind face of the 1st basal joint, inner ramus somewhat shorter than the 1st joint of the outer, and distinctly biarticulate, carrying

on the tip 2 unequal spines, one of them rather slender and elongated; terminal joint of outer ramus well defined though very small, inner apical spine about 3 times as long as the outer. Ovisac very large and oval in form.

Male considerably smaller and more slender than female, with the lateral parts of last pedigerous segment less expanded, though, as in the female, bifurcate at the tip. Right anterior antenna with the middle section considerably tumefied, terminal section without any projections or denticles. Last pair of legs with the inner ramus developed almost equally on both sides, that of right leg reaching beyond the 1st joint of the outer ramus, 2nd basal joint of same leg with a hyaline lamella inside in the middle, proximal joint of outer ramus acutely produced at the end outside, distal joint with the spine of the outer edge placed in front of the middle; apical claw very strong and evenly curved. Left leg scarcely reaching beyond the penultimate joint of the right, terminal joint rounded, finely ciliated inside and projecting at the tip in a quite short, digitiform process, inside which a short blunt spine is fixed.

Colour of female generally yellowish or orange, that of male more reddish. Usual length of adult female 2.10 mm., of male 1.90 mm.

Remarks.—This form was described as early as the year 1820 by Jurine as *Monoculus castor*. The *Glaucea rubens* of Koch seems to be the same species, and it is very probable that the 3 forms recorded by O. Fr. Muller as *Cyclops cæruleus, rubens* and *lacinulatus* are also referable to the present species. It is the largest of our Diaptomi, and is moreover easily recognized by its comparatively robust body, the form of the lateral expansions of the last pedigerous segment, and that of the genital segment in the female, and finally, by the unusually short anterior antennæ.

Occurrence.—I have hitherto only met with this form in 4 localities, 3 of which belong to the southern part of Norway, viz., Sandösund, Fredriksværn, Mærdö, whereas the 4th, Tjötö, is located much farther north, on the Nordland coast. In all 4 places it only occurred in shallow pools of small dimensions.

Distribution.— Sweden (Lilljeborg), British Isles (Brady), Germany (Schmeil), Switzerland (Jurine), France (Richard), Spain (Bolivar).

35. Diaptomus denticornis, Wierzejski.

(Pl. LIX).

Diaptomus denticornis, Wierzejski, O. krajowych skorupiaksach zrodziny Calanidæ. Nozgrawn. i Spraw. Wydz, matem. przyr. Akad. Unnej. Vol. XVI, p. 8.

Syn: *Diaptomus castor*, G. O. Sars (not Jurine).
" " *gracilis var.*, Wierzejski.
" " *hamatus*, Lilljeborg, M. S.

Specific Characters.—Female. Body somewhat less robust than in *D. castor*, and less strongly vaulted above. Anterior division, seen dorsally, oblong in form, greatest width but slightly exceeding $^1/_3$ of the length, and occurring in the middle, anterior extremity considerably contracted, posterior subtruncate. Lateral expansions of last pedigerous segment rather large, biangular, outer angle more prominent than inner. Urosome comparatively short, but slightly exceeding $^1/_3$ of the length of the anterior division, genital segment much longer than the other 2 combined, and but very slightly dilated in front, without any distinct lateral denticles; the last 2 segments imperfectly separated dorsally. Caudal rami very short, not nearly twice as long as they are broad. Anterior antennæ, when reflexed, reaching to about the end of the genital segment. Posterior maxillipeds not nearly so robust as in *D. castor*, 2nd basal joint much narrower, terminal part considerably exceeding this joint in length. Last pair of legs without any prominence on the hind face of the 1st basal joint, inner ramus very narrow, uniarticulate, and fully as long as the 1st joint of the outer ramus, terminal joint of the latter obsolete, and replaced by a slender spine. Ovisac large, subcordate in form.

Male of the usual slender form, and having the lateral parts of last pedigerous segment scarcely at all expanded. Right anterior antenna with the middle section considerably tumefied, antepenultimate joint of terminal section bordered in front by a hyaline rim projecting at the end to a triangular prominence, last joint terminating in a hook-like anteriorly-curving projection. Last pair of legs with the inner ramus very small, that of right leg not even reaching to the middle of the proximal joint of outer ramus, this joint obtusely produced at the end outside, with a small denticle on the hind face of the projection, distal joint with the spine of the outer edge situated beyond the middle, apical claw slender and but slightly curved. Left leg scarcely projecting beyond the penultimate joint of the right, terminal joint rounded, projecting at the end to a short, blunt, digitiform process, on the outer side of which there is a small simple spine.

Colour of female generally bluish, of male reddish orange.

Length of adult female 2.00 mm., of male 1.50 mm.

Remarks.—This form was at first (in the year 1863) erroneously described by the present author as *D. castor* (Jurine). The same form was subsequently examined by Mr. Wierzejski, who at first regarded it as only a variety of *D. gracilis*, G. O. Sars, but in a subsequent paper recorded it as a distinct species under the above name. Prof. Lilljeborg assigned to this form the provisional name *D. hamatus*, on account of the hook-like projection of the last joint of the right anterior antennæ in the male, and the name proposed by Mr. Wierzejski also refers to the same character. In addition to this character, the present species may be easily recognized by the form of the lateral expansions of the last pedigerous segment in the female, and also by that of the genital segment. The last pair of legs, moreover, exhibit in both sexes several well-marked peculiarities.

Occurrence.—I have found this form very abundantly in the neighbourhood of Christiania, especially in small ponds, but sometimes also in larger lakes. It also occurs in many other places in Norway, both in the lowland and in the mountain districts, and extends northwards as far as Bodö.

Distribution.—Sweden (Lilljeborg), Tatras Mountains (Wierzejski), Switzerland, France (Richard), territory of Akmolinsk, Central Asia (Lepeschkin).

36. Diaptomus bacillifer, Koelbel.

(Pl. LX).

Diaptomus bacillifer, Koelbel, Carcinologisches. Sitzungsber. d. K. K. Akad. Wiss. Wien, Vol. XC.

Syn: *Diaptomus montanus*, Wierzejski.
„ — *retusus*, Lilljeborg, M. S.

Specific Characters.—Female. Body somewhat robust, with the anterior division, seen dorsally, oblong oval in form, greatest width considerably exceeding $^1/_3$ of the length, and occurring somewhat in front of the middle. Lateral expansions of last pedigerous segment somewhat resembling those in *D. denticornis*, but less distinctly biangular. Genital segment fully twice as long as the other 2 caudal segments combined, and slightly dilated in front, with a very small denticle on each side. Caudal rami about twice as long as they are broad. Anterior antennæ, when reflexed, reaching about to the middle of the genital segment. Last pair of legs with the inner ramus much shorter than the 1st joint of the outer, but distinctly biarticulate, tip blunted and somewhat incurved, with a very small hair

outside; terminal joint of outer ramus well defined, with the apical spines of moderate length. Ovisac rounded.

Male considerably smaller and more slender than female, with the lateral parts of last pedigerous segment only very slightly expanded, though on right side distinctly biangular. Right anterior antenna in male with the middle section moderately tumefied, antepenultimate joint of terminal section produced at the end anteriorly to a straight rod-like process obtuse at the tip and extending somewhat beyond the penultimate joint. Last pair of legs with the inner rami well developed, though uniarticulate and acute at the tip, that of right leg extending nearly to the middle of the distal joint of the outer ramus, 2nd basal joint of this leg with a small hyaline lamella in the middle of the inner edge, proximal joint of outer ramus produced at the end outside to a triangular projection, distal joint with the spine of the outer edge situated about in the middle, apical claw considerably curved. Left leg extending beyond the middle of the terminal joint of the right, 2nd basal joint with an appressed spiniform projection inside, terminal joint produced at the end to a rather long and narrow digitiform process, inside which stands a slender denticulated spine.

Colour of female yellowish orange, that of male dark red.

Length of adult female 1.80 mm., of male 1.40 mm.

Remarks.—In its external appearance, this form somewhat resembles *D. denticornis.* On a closer examination, however, it may be easily distinguished by the more robust form of the body, and the comparatively shorter anterior antennæ, but especially by the peculiar rod-like projection of the antepenultimate joint of the right anterior antenna in the male. Moreover, the last pair of legs in both sexes exhibit several well-marked differences.

Occurrence.—The only place where I have met with this form is in the farthest north of Norway, at Vardö, Finmark. It occurred here rather abundantly in a shallow tarn situated close to the town. In the same tarn the arctic Phyllopod, *Branchinecta paludosa,* was very common, and the water was moreover peopled with large shoals of *Daphina magna.*

Distribution.—Mountain lakes of Central Europe (Koelbel, Wierzejski), British Isles (Brady), Siberia (Lilljeborg) as far north as the New Siberian Islands (the present author), territory of Akmolinsk (Lepeschkin).

37. Diaptomus laticeps, G. O. Sars.

(Pl. LXI).

Diaptomus laticeps, G. O. Sars. Oversigt af de indenlandske Ferskvandscopepoder. Chr. Vid. Selsk. Forh. 1862, p. 10.

Specific Characters—Female. Body moderately slender, with the anterior division, seen dorsally, oblong in form, greatest width somewhat exceeding $^1/_3$ of the length, and occurring quite in front, across the middle of the cephalosome, anterior extremity broadly rounded, posterior gradually attenuated: seen laterally, considerably dilated in front, with the dorsal margin of the cephalosome boldly curved. Lateral expansions of last pedigerous segment comparatively small and scarcely at all extant, outer corner distinct, inner obsolete. Genital segment more than twice as long as the other 2 caudal segments combined, and slightly dilated in front, with a very small denticle on each side. Caudal rami fully as long as the last 2 caudal segments combined, and slightly widening distally. Anterior antennæ, when reflexed, extending about to the base of the caudal rami. Last pair of legs with a well-marked triangular projection on the hind face of 1st basal joint, inner ramus very short and uniarticulate, scarcely reaching beyond the middle of the 1st joint of the outer ramus, terminal joint of the latter well defined, though rather small, apical spines comparatively short. Ovisac rounded.

Male much smaller and more slender than female, resembling that of the preceding species, but somewhat more dilated anteriorly. Right anterior antenna with the antepenultimate joint produced at the end anteriorly to a somewhat securiform projection extending about to the middle of the penultimate joint. Both legs of last pair with a small hyaline lamella inside the 2nd basal joint, inner ramus well developed, acuminate, that of right leg reaching beyond the middle of the distal joint of outer ramus, proximal joint of the latter produced at the end outside to a remarkably strong spiniform projection, distal joint with the spine of the outer edge situated about in the middle, apical claw sharply curved, sub-sigmoid. Left leg extending to about the middle of the terminal joint of the right, last joint produced at the end to a very narrow and elongated digitiform process, and carrying inside it a still longer setiform spine.

Colour generally bluish.

Length of adult female reaching 1.80 mm., of male 1.40 mm.

Remarks.—This species may be easily recognized by the strongly dilated cephalosome, the small size of the lateral expansions of the last pedigerous segment in the female, and the structure of the last pair of legs in both sexes. The right anterior antenna of the male is moreover distinguished by the shape of the projection of its antepenultimate joint.

Occurrence.—I have met with this form in several of the Norwegian mountain lakes, for instance, Aursundsjö, Afsjö, Gaavelivand, Lesjevand, as also in some lakes in the districts of Romsdal and Trondhjem; and Mr. Huitfeldt-Kaas has recently found it in several lakes in the western part of the country.

Distribution.—Jemtland, Sweden (Lilljeborg).

38. Diaptomus laciniatus, Lilljeborg.

(Pl. LXII).

Diaptomus laciniatus, Lilljeborg, in J. de Guerne and J. Richard, Révision des Calanides d'eau douce, p. 47, Pl. 1, figs. 22, 24, 25.

Specific Characters.—Female. Body somewhat robust of form. Anterior division, seen dorsally, oblong oval in outline, greatest width considerably exceeding $^1/_3$ of the length and occurring somewhat in front of the middle, anterior extremity rounded, posterior somewhat irregular. Last 2 segments of metasome confluent dorsally, and each produced laterally to very conspicuous extant linguiform lobes, the anterior pair obtuse at the tip, the posterior acuminate. Urosome comparatively short, genital segment slightly dilated in front, but without any lateral denticles. Caudal rami scarcely twice as long as they are broad. Anterior antennæ, when reflexed, extending to about the base of the caudal rami. Last pair of legs with a distinct triangular projection on the hind face of 1st basal joint, inner ramus uniarticulate and extending almost to the end of the 1st joint of the outer, tip acutely produced, terminal joint well defined, with the apical spines comparatively short. Ovisac rounded and, as a rule, containing only a limited number of ova.

Male of the usual appearance, with the last 2 pedigerous segments well defined and not expanded laterally. Terminal part of right anterior antenna simple, without any projection of the antepenultimate joint. Last pair of legs with the inner edge of 2nd basal joint quite smooth, without any projecting lamella, inner ramus of right leg somewhat larger than that of left, and extending almost to the tip of the distal joint of the outer ramus, proximal joint of the latter produced at the end outside to a comparatively short triangular projection, distal joint with the spine of the outer edge situated about in the middle, apical claw greatly curved. Left leg extending beyond the middle of the terminal joint of the outer, last joint produced at the end to a comparatively short and blunt digitiform process, on the inner side of which there is a similarly short spine.

Colour sometimes dark bluish, sometimes reddish orange.

Length of adult female 1.60 mm., of male 1.40 mm.

Remarks.—The female of this species is at once recognized by the peculiar shape of the last 2 pedigerous segments, both of which are produced laterally to very conspicuous, freely-projecting expansions separated on each side by a narrow incision. Otherwise it is nearly allied to *D. laticeps,* differing somewhat, however, in the structure of the last pair of legs in both sexes, as also in the total absence of any projection on the antepenultimate joint of the right anterior antenna in the male.

Occurrence.—Prof. Lilljeborg first found this form in a small lake situated on the summit of the Flöifjeld near Bergen, and also received it from the Österdal through Miss B. Esmark. I have myself met with it in many places in the country, both in lowland and in mountain lakes, and, according to the recent investigations of Mr. Huitfeldt-Kaas, it is generally distributed in the lakes of western Norway. The most northern locality where I have found it is the mainland opposite Vardö, Finmark. It here occurred very abundantly in shallow tarns together with *Heterocope borealis* and 2 Phyllopods, viz., *Branchinecta paludosa* and *Polyartemia forcipata.* All the specimens occurring here were of a dark reddish orange hue, whereas those from other tracts more generally exhibited a bluish colour.

Distribution.—Scotland (Scott), Lake of Geneva (Cleve), Russian Lapland and the Kola Peninsula (Lilljeborg).

39. Diaptomus gracilis, G. O. Sars.

(Pl. LXIII).

Diaptomus gracilis, G. O. Sars. Oversigt af de indenlandske Ferskvandscopepoder. Chr. Vid. Selsk. Forh. 1862, p. 9.

Syn: *Diaptomus Westwoodi,* Lubbock.

Specific Character—Female. Body very slender in form, with the anterior division, seen dorsally, narrow oblong in form, greatest width not attaining $^1/_3$ of the length, and occurring about in the middle, anterior extremity considerably contracted, posterior subtruncate. Lateral expansions of last pedigerous segment very distinctly biangular, each corner tipped with an acute denticle, the outer one rather produced and pointing straight outwards. Genital segment somewhat longer than the other 2 caudal segments combined, and gradually dilated in front, with a very conspicuous acute denticle on each side. Caudal rami comparatively short, being scarcely more than twice as long as they are broad. Anterior antennæ exceedingly slender and elongated, extending, when reflexed, far beyond the caudal rami, in some cases by as much as the 4 or 5 outer joints, in other cases by only 3 of the joints.

Last pair of legs with a well-marked triangular projection on the hind face of 1st basal joint, inner ramus uniarticulate and rather short, not extending nearly to the end of the 1st joint of the outer ramus, terminal joint of the latter well defined and of larger size than usual, inner apical spine rather elongated, reaching as far as the tip of the claw-like projection of the preceding joint. Ovisac in some cases rather large, sub-cordate, in other cases comparatively small, with only a limited number of ova.

Male still more slender than female, with the lateral parts of last pedigerous segment less expanded, though somewhat more prominent on right side. Right anterior antenna with the middle section not much tumefied, ante-penultimate joint of terminal section produced at the end anteriorly to a hook-like process, in some cases very prominent, in other cases much reduced in size. Last pair of legs comparatively very large, with the inner rami rather dissimilar, that of right leg being much the larger and somewhat tumefied, almost fusiform in shape, extending far beyond the middle of the distal joint of the outer ramus, proximal joint of the latter produced at the end outside to a comparatively short triangular projection, distal joint very large and broad, with the spine of the outer edge occurring somewhat in front of the middle, apical claw considerably curved in its distal part. Left leg extending scarcely as far as the penultimate joint of the right, inner edge of 2nd basal joint angularly produced beyond the middle, terminal joint with a comparatively small lamellar expansion inside the base, and gradually tapering to a simple digitiform process, inside which there is a small seta, standing out from the joint at a right angle, and terminating in a brush of delicate diverging cilia.

Colour. Body generally very pellucid and almost colourless, in some cases, however, ornamented with a broad transverse band of a chocolate hue across the anterior division.

Length of adult female 1.40 mm., of male 1.20 mm.

Remarks.—This form is easily recognizable from the 5 preceding species by its slender form, but especially by the exceedingly elongated anterior antennæ. Moreover the shape of the lateral expansions of the last pedigerous segment in the female, and the structure of the last pair of legs in both sexes is rather characteristic. Two varieties of this species occur in Norway, the one with the anterior antennæ quite extraordinarily prolonged, the other with these appendages somewhat shorter, but otherwise exactly agreeing with the former, no difference whatever being found in the structure of the last pair of legs in either of the sexes. The form described by Lubbock as *D. Westwoodi* seems more properly to be referable to the latter variety.

Occurrence.—In the southern part of Norway this is one of the commonest Diaptomi, occurring very abundantly in almost all the larger lowland lakes, and constituting there the essential bulk of the zoöplankton.

Distribution. Sweden (Lilljeborg), Finland (Nordquist), British Isles (Lubbock), Germany (Schmeil), Switzerland (Imhof), Hungary (Daday), Italy (Pavesi).

40. Diaptomus graciloides, Lilljeborg.

(Pl. LXIV).

Diaptomus graciloides, Lilljeborg. Description de deux nouvelles espèces de Diaptomus du Nord de l'Europe. Bull. Soc. Zool. France, Vol. XIII, p. 156.

Specific Characters—Female. Very like the preceding species, but somewhat less slender in form, and also of rather inferior size. Lateral parts of last pedigerous segment but very slightly expanded and not at all extant, being rounded off at the tip, though exhibiting the 2 usual denticles, which however are much smaller than in *D. gracilis.* Genital segment rather narrow, being far less dilated in its anterior part than in the above species, lateral denticles extremely small. Caudal rami about as in *D. gracilis* Anterior antennæ very slender and elongated, reaching, when reflexed, considerably beyond the caudal rami (by about the 2 or 3 outer joints). Last pair of legs with a very small, somewhat linguiform projection on the hind face of the 1st basal joint, inner ramus imperfectly biarticulate, and reaching somewhat beyond the 1st joint of the outer ramus, terminal joint of the latter well defined, though somewhat smaller than in *D. gracilis*, inner apical spines, as in that species, very slender, extending as far as the tip of the unguiform projection of the preceding joint. Ovisac small, with a very limited number of ova.

Male resembling that of *D. gracilis,* though somewhat less slender. Antepenultimate joint of right anterior antenna without any trace of a projection at the end. Last pair of legs comparatively less powerful than in *D. gracilis,* inner rami of about equal size and simple cylindric in form, that of right leg not extending to the middle of the distal joint of the outer ramus, proximal joint of the latter very slightly produced at the end outside, distal joint much smaller than in *D. gracilis,* with the spine of the outer edge situated beyond the middle, apical claw irregularly flexuous. Left leg extending far beyond the penultimate joint of the right, inner edge of 2nd basal joint perfectly smooth, terminal joint of a similar form to that in *D. gracilis,* but with the seta of the inner edge not penicillate, and extended straight downwards.

Colour. Body generally very pellucid and almost colourless, in some cases, however, of a dark bluish hue.

Length of adult female 1.30 mm., of male 1.00 mm.

Remarks.—I am by no means prepared to agree with Prof. Brady in regarding this form as only a variety of *D. gracilis.* True, it is nearly allied to this species; but on a closer comparison, several well-marked differences are found to exist, which seem to be fairly constant and prove this form to be in reality a well-defined species. I was also long ago aware of the existence of this form, and had assigned to it the provisional name *D. microlobatus,* on account of the small size of the lateral expansions of the last pedigerous segment in the female.

Occurrence.—I have met with this form occasionally in the lake Femsjö, situated at the south-eastern corner of Norway, and also not unfrequently in small tarns at Hammerfest and at Matsjok, Finmark. According to Mr. J. Richard, it has also been found in great abundance, by Mr. Ch. Rabot in the great lake, Rösvand, in Nordland.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), mountain lakes of the Eifel, Germany (Zacharias), Kola Peninsula (Lilljeborg), territory of Akmolinsk, Central Asia (Lepeschkin).

Fam. 15. Temoridæ.

Characters.—Body of varying form, in some cases rather short and stout, in other cases comparatively slender. Cephalosome well defined from the 1st pedigerous segment, front unarmed, or provided with 2 soft tentacular appendages. Last 2 segments of metasome confluent, or at any rate imperfectly defined. Urosome consisting in female of 3, in male of 5 segments; caudal rami of different structure in the different genera. Anterior antennæ consisting in female of 24 or 25 articulations; right antenna in male distinctly geniculate. Posterior antennæ and oral parts on the whole normal. The 4 anterior pairs of legs with the joints of the inner rami more or less reduced in number. Last pair of legs in both sexes simple, not natatory, without any trace of inner rami; those in male, as usual, larger than in female, and prehensile. Ovisac in some cases present, but more frequently wanting.

Remarks.—This family, as defined above, is chiefly distinguished from the *Centropagidæ* and *Diaptomidæ* by the structure of the legs, and more particularly those of the last pair, which never are natatory, nor exhibit in either of the sexes any trace of inner rami. In the 4 anterior pairs these rami are moreover, as a rule, much reduced in size, constituting in some cases small uniarticulate pieces. The family comprises as yet 7 well-defined genera, viz, *Temora*, Baird, *Temoropia*, Scott, *Temorites*, G. O. Sars, *Eurytemora*, Giesbrecht, *Heterocope*, G. O. Sars, *Epischura*, Forbes, and *Lamellipodia*, Schmeil. Of these genera, the first 3 comprise exclusively marine species, the 4th chiefly brack-water forms, whereas the last 3 genera are peculiar to inland lakes. In the Norwegian fauna 3 of the genera are represented, and will be treated of below.

Gen. 24. **Temora**, Baird, 1850.

Syn: *Halitemora*, Giesbrecht.

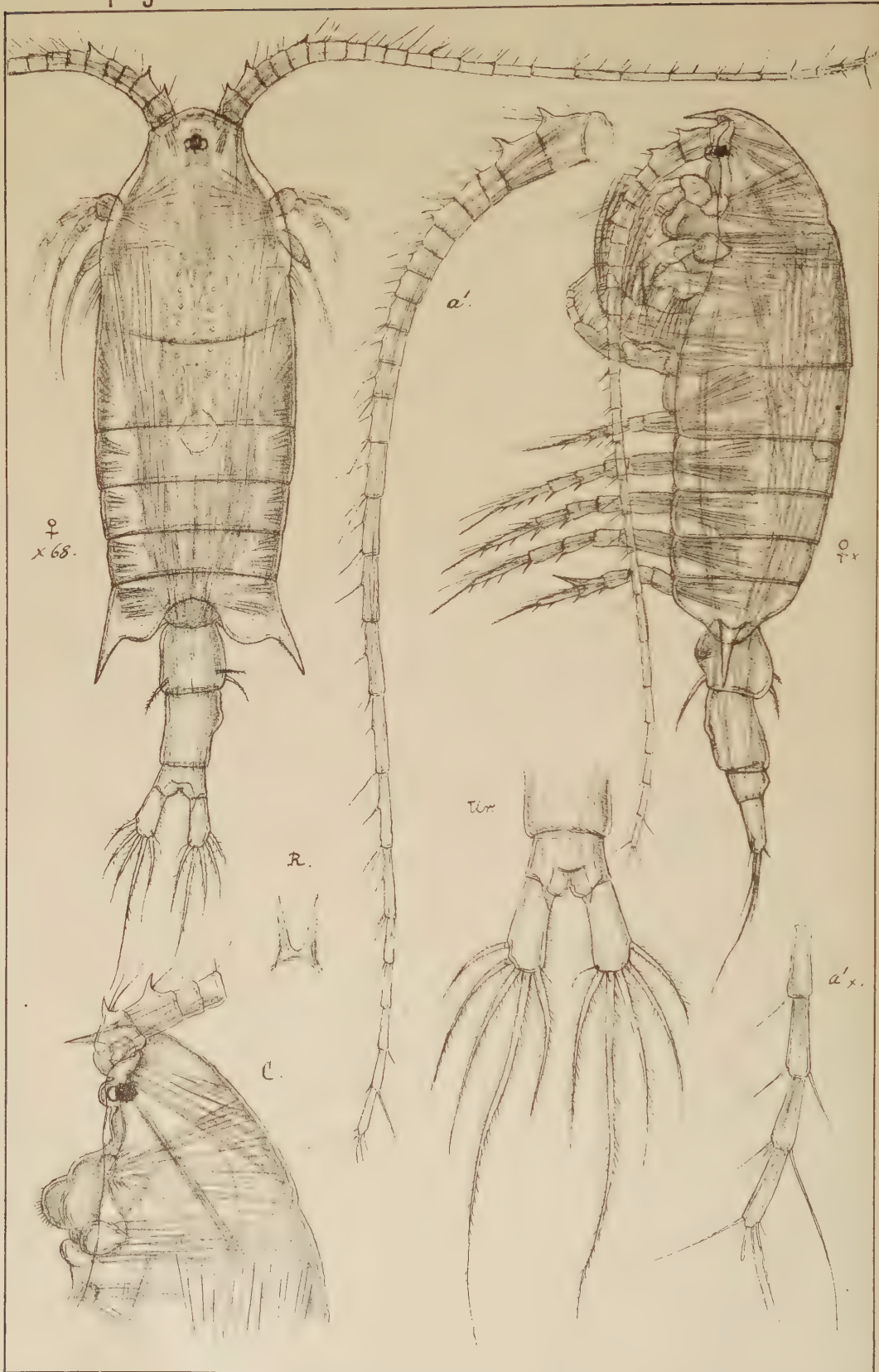
Generic Characters.—Form of body short and compact, with the anterior division considerably vaulted above. Cephalosome remarkably dilated and exhibiting at the end dorsally a gibbous prominence; front tipped with 2 very slender and delicate, recurved tentacular appendages. Last 2 segments of metasome confluent. Urosome with the genital segment in female comparatively short and scarcely at all protuberant below. Caudal rami narrow and elongated, being remarkably divaricate, and in some cases asymmetrical, setæ comparatively short and present in the normal number, the outermost one being attached to the outer edge at some distance from the others. Eye very small. Anterior antennæ slender and elongated, composed in female of 24 articulations only, the last 2 being confluent. Posterior antennæ with the outer ramus scarcely longer than the inner, and 7-articulate. Anterior lip not much prominent, rounded below. Oral parts of quite normal structure. Natatory legs with the inner rami comparatively small and biarticulate; 2nd to 4th pairs with the first 2 joints of the outer ramus imperfectly separated in female, terminal joint with 3 spines outside, apical spine coarsely serrate. Last pair of legs in female very small, 3-articulate, first 2 joints simple, last one dentate at the tip; those in male very asymmetrical, left leg much the larger, 4-articulate, and distinctly forcipate, 2nd joint being produced inside to a long curved thumb-like process, against which the outer part admits of being impinged; right leg 3-articulate, with the terminal joint unguiform, incurved. No ovisac present in female.

Copepoda

Calanoida

Centropagidæ

PI. XLIX.

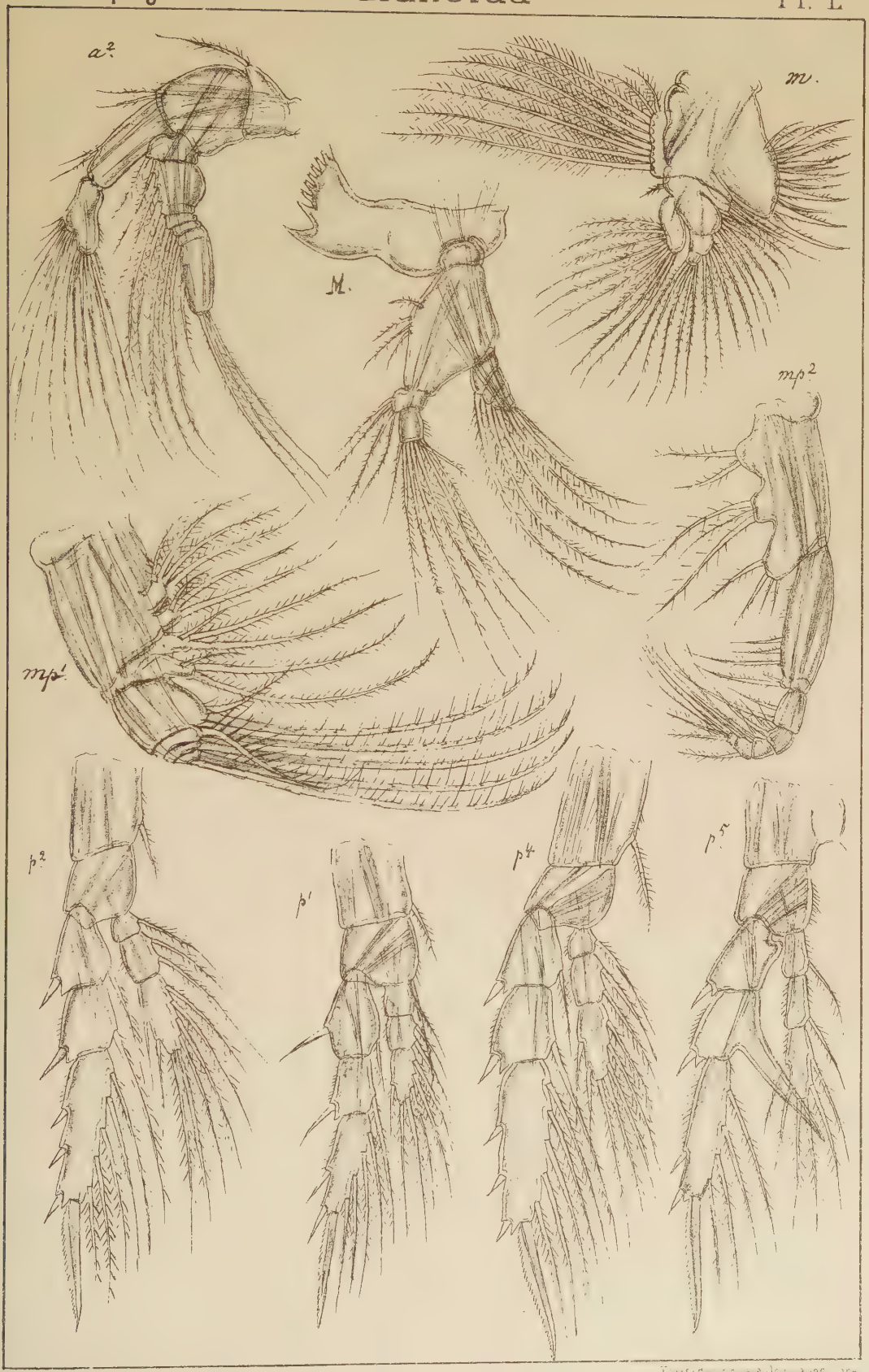


G.O. Sars autogr.

Centropages typicus, Kröyer.

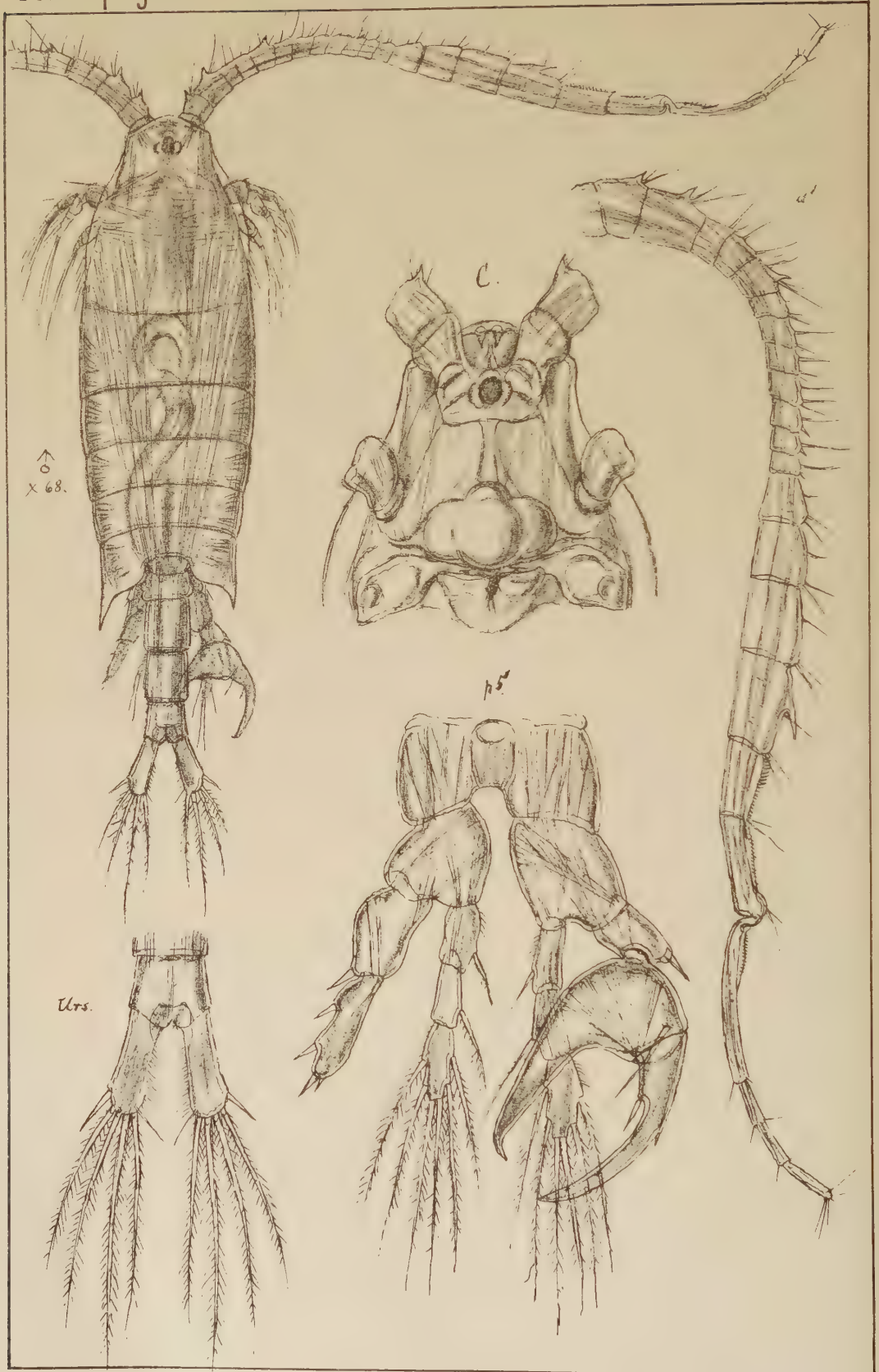
Trykt i den private Opmaaling, Chra

Copepoda
Calanoida



G. O. Sars autogr.

Centropages typicus, Kröyer.
(continued.)

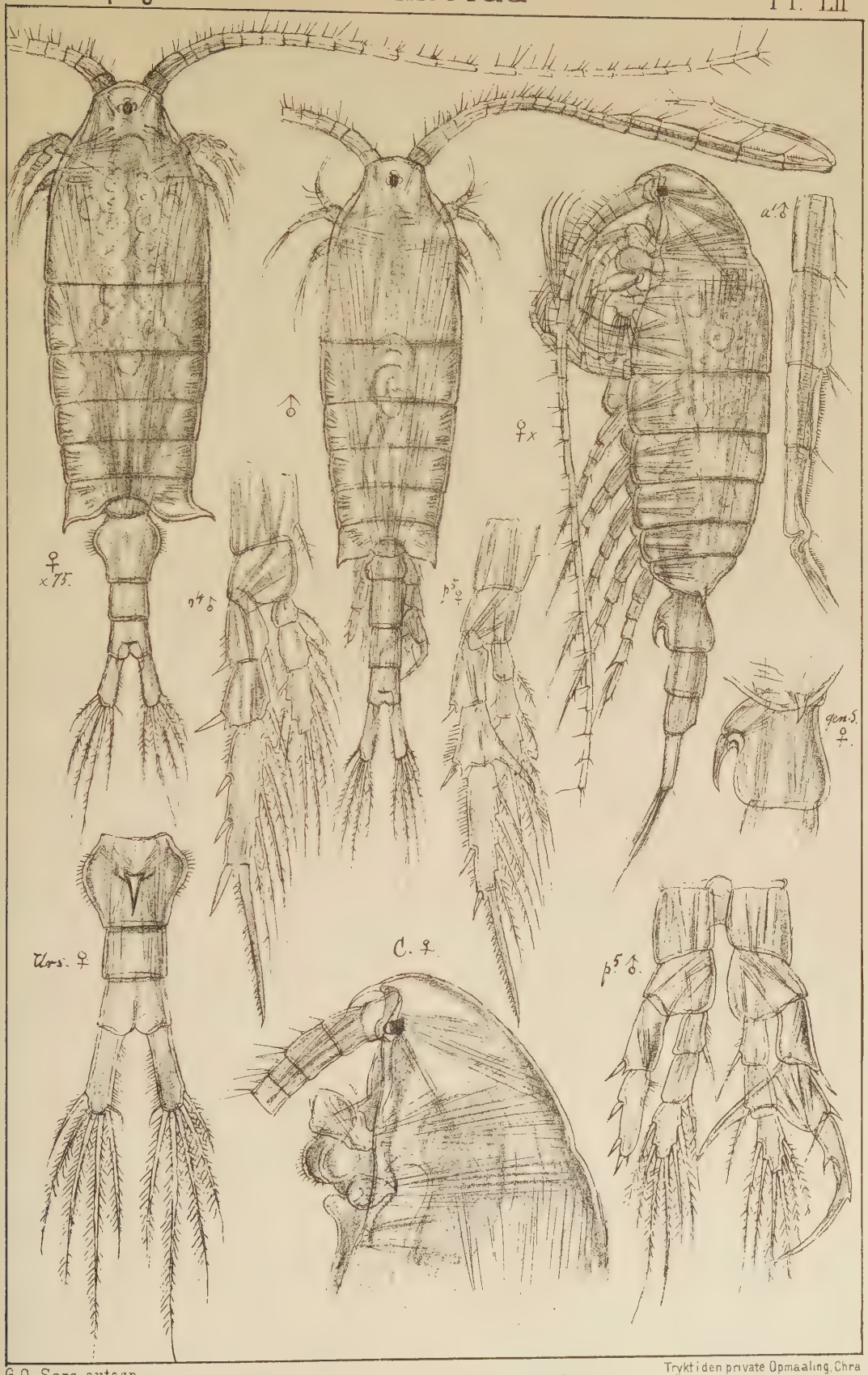


G.O. Sars autogr

Trykt i den private Opmaaling, Chra

Centropages typicus, Kröyer.
(male.)

Copepoda
Calanoida



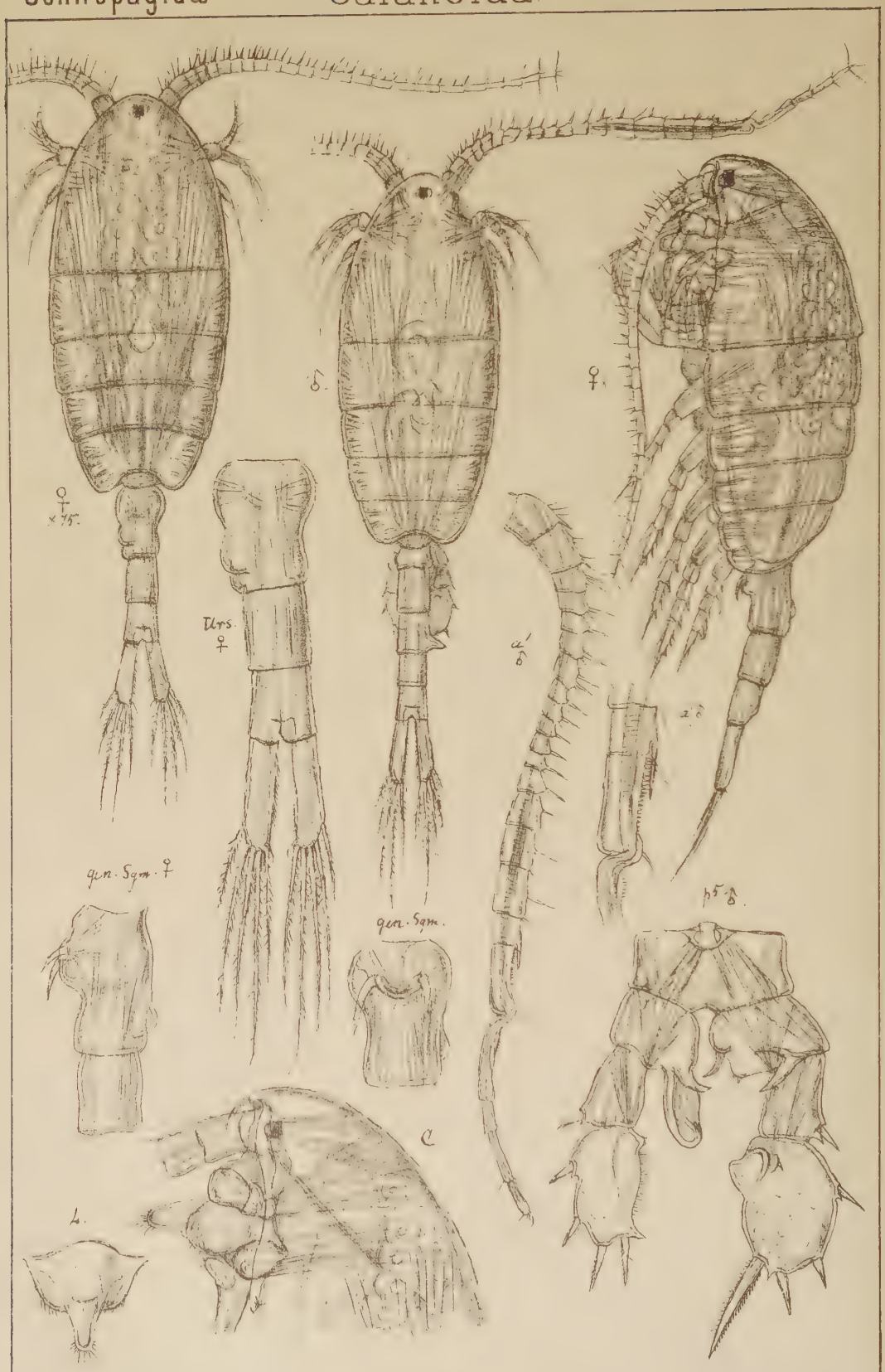
G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Centropages hamatus, (Lilljeb.)

Copepoda

Centropagidæ — Calanoida — PI. LIII.



G.O. Sars autogr

Tryk i den private Opmaaling, Chra

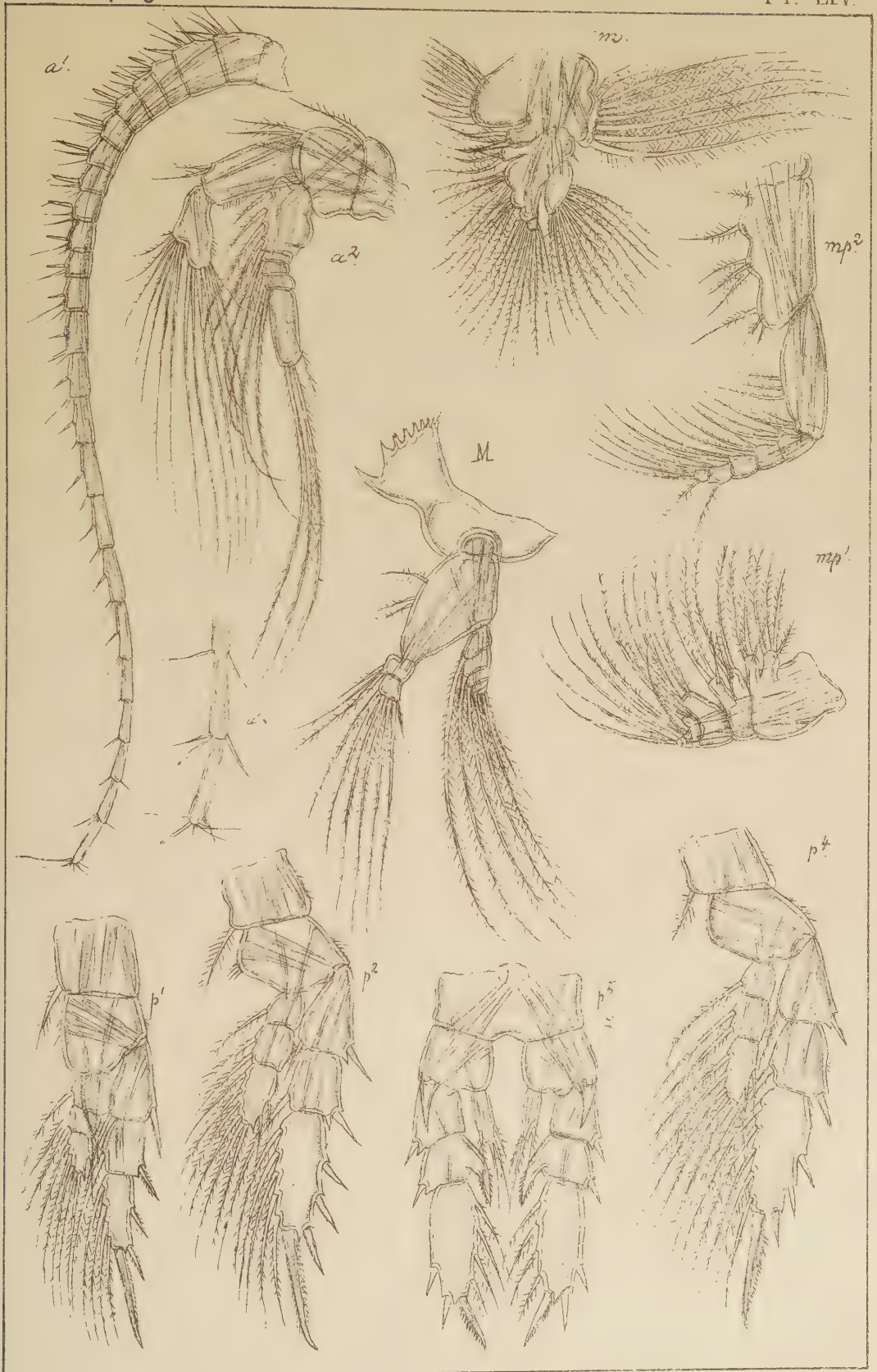
Isias clavipes, Boeck.

Copepoda

Calanoida

Centropagidæ

PI. LIV.



G. O. Sars autogr.

Trykt i den private Opmaaling, Chra

Isias clavipes, Boeck.

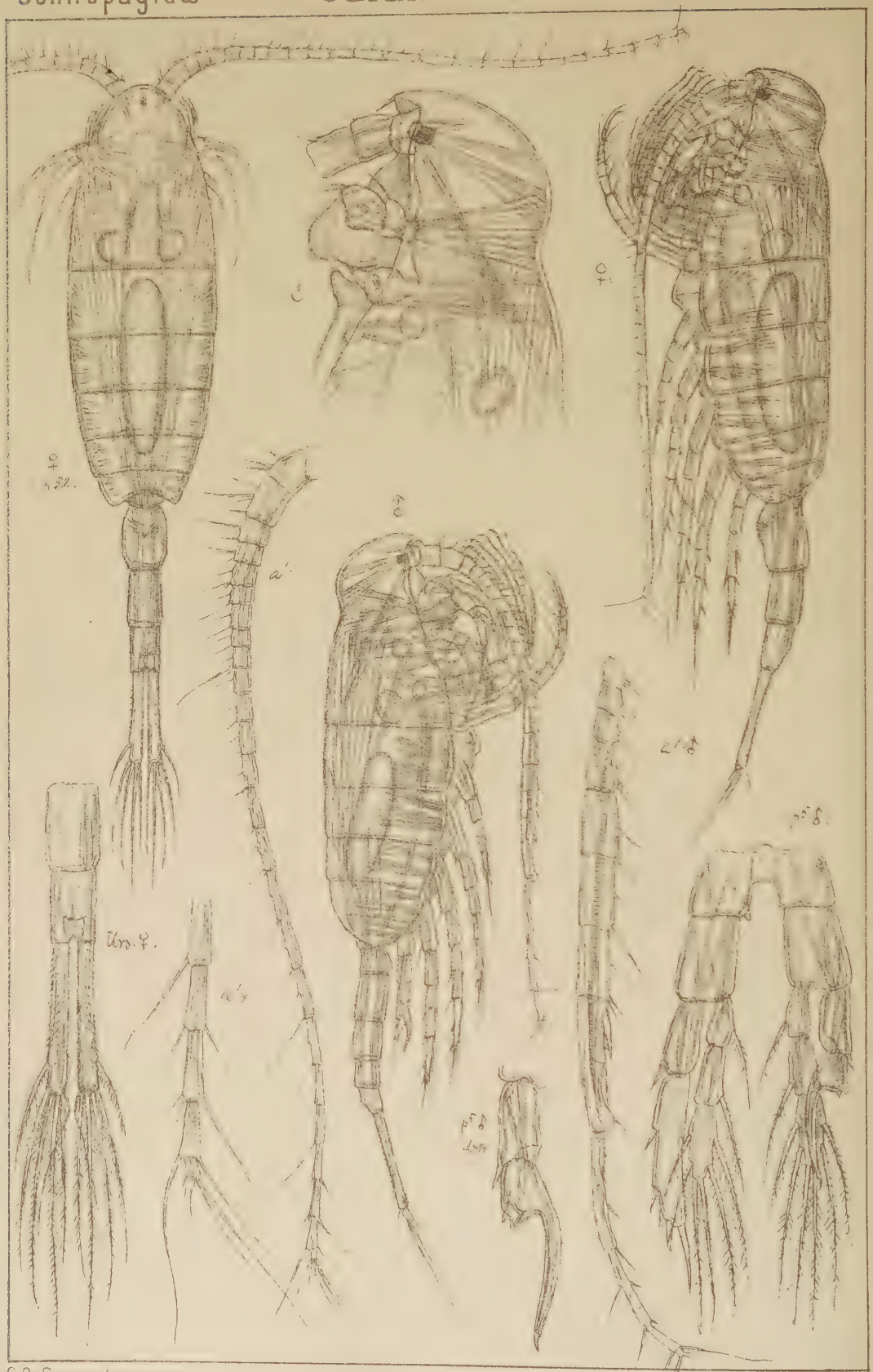
(continued.)

Copepoda

Calanoida.

Centropagidæ

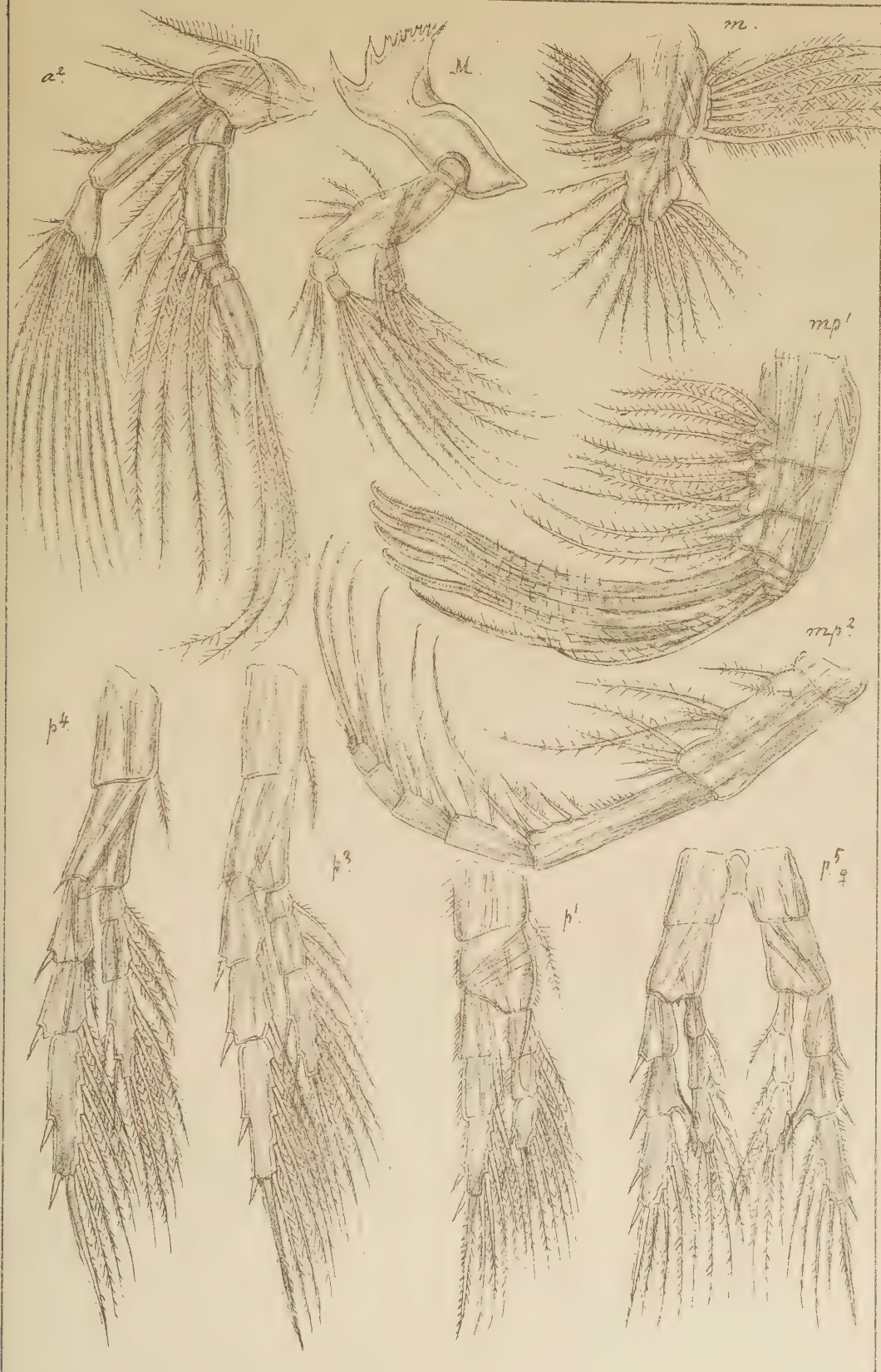
PI. LV.



G.O. Sars autogr

Trykt i den private Opmaaling, Chra.

Limnocalanus macrurus, G.O.Sars..



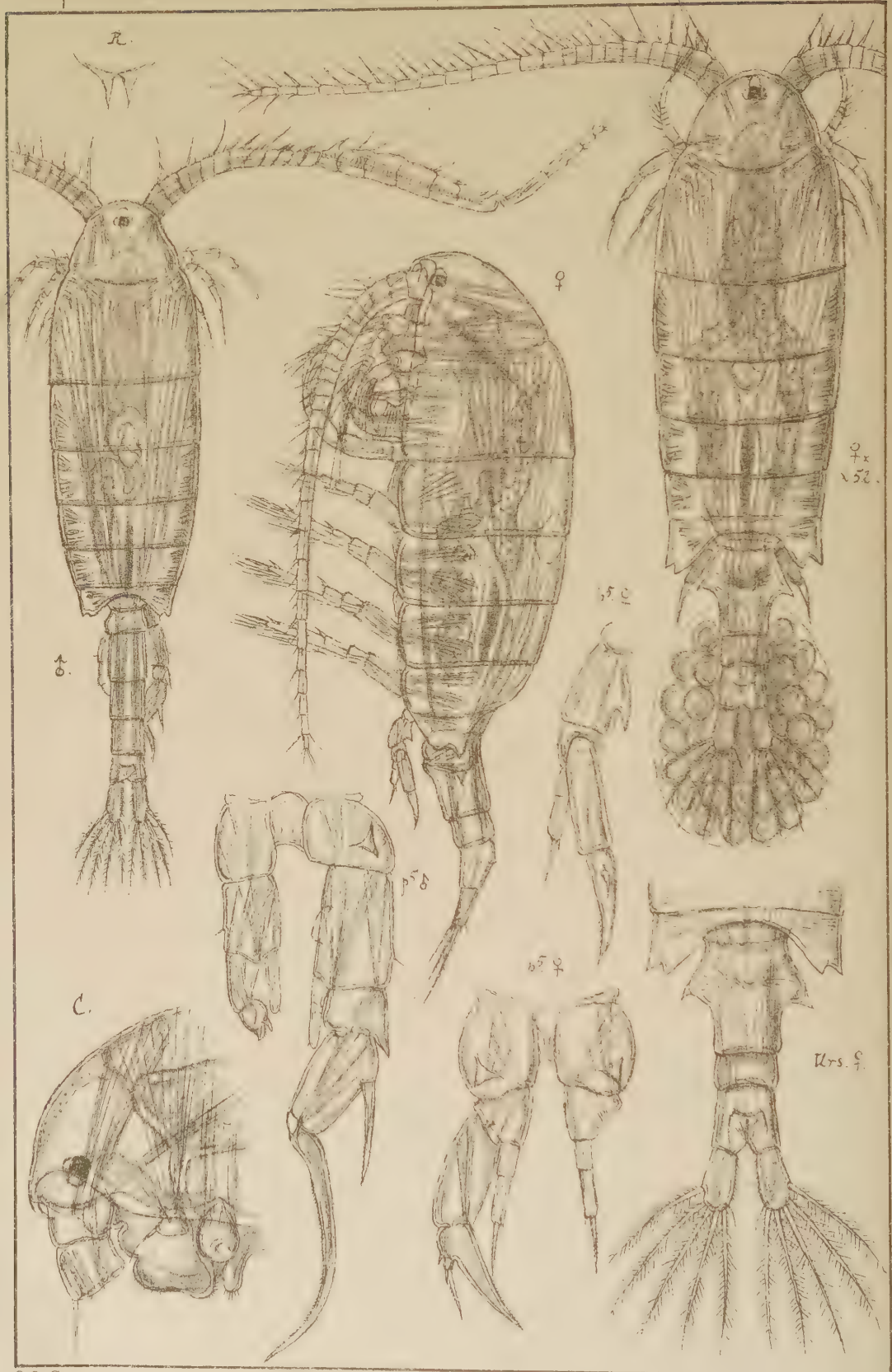
G. O. Sars autogr.

Trykt i den private Opmaaling, Chra

Limnocalanus macrurus, G. O. Sars.
(continued.)

Copepoda

Diaptomidæ — Calanoida — Pl. LVII

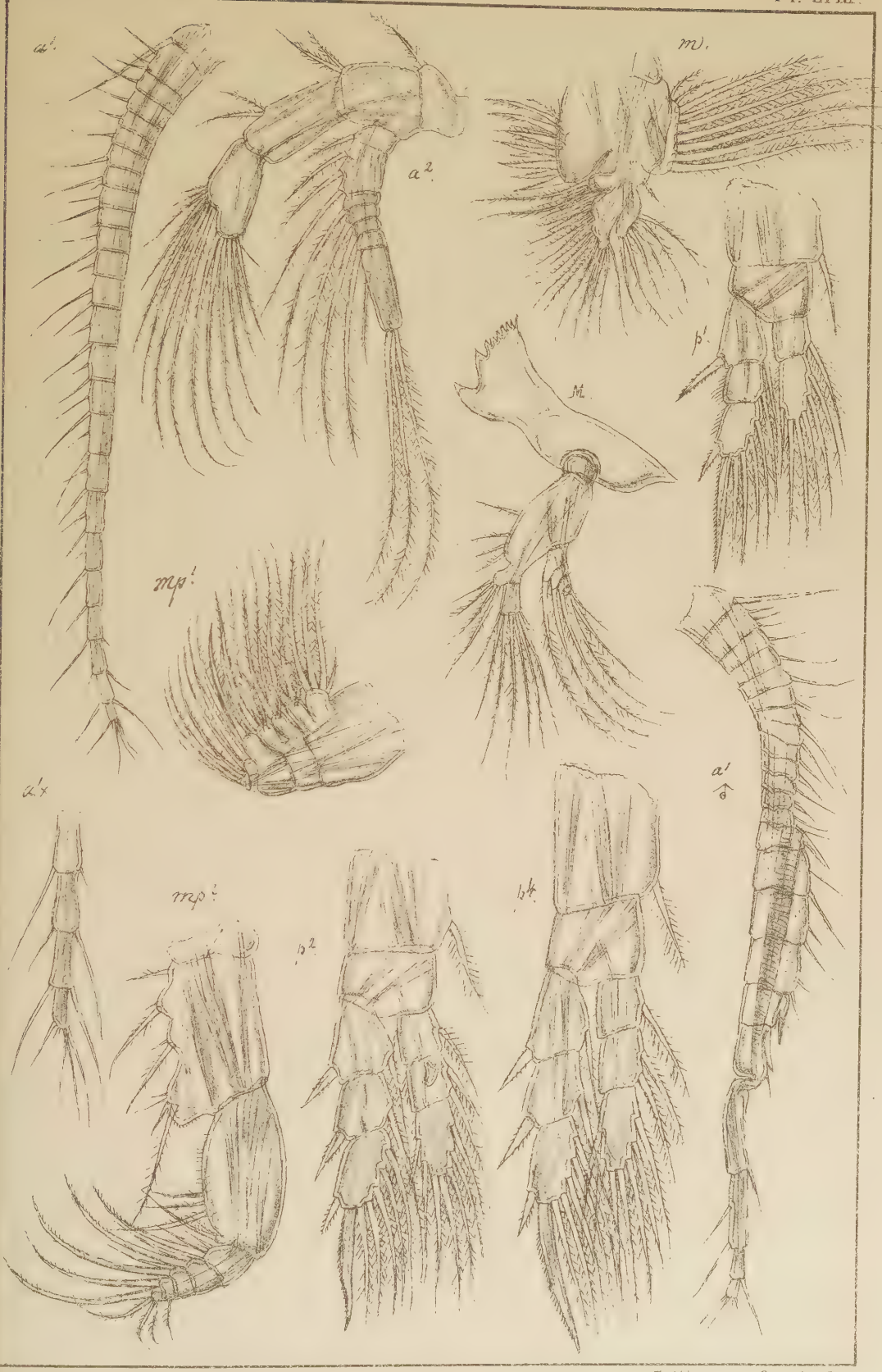


G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Diaptomus castor (Jurine.)

Copepoda
Calanoida



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

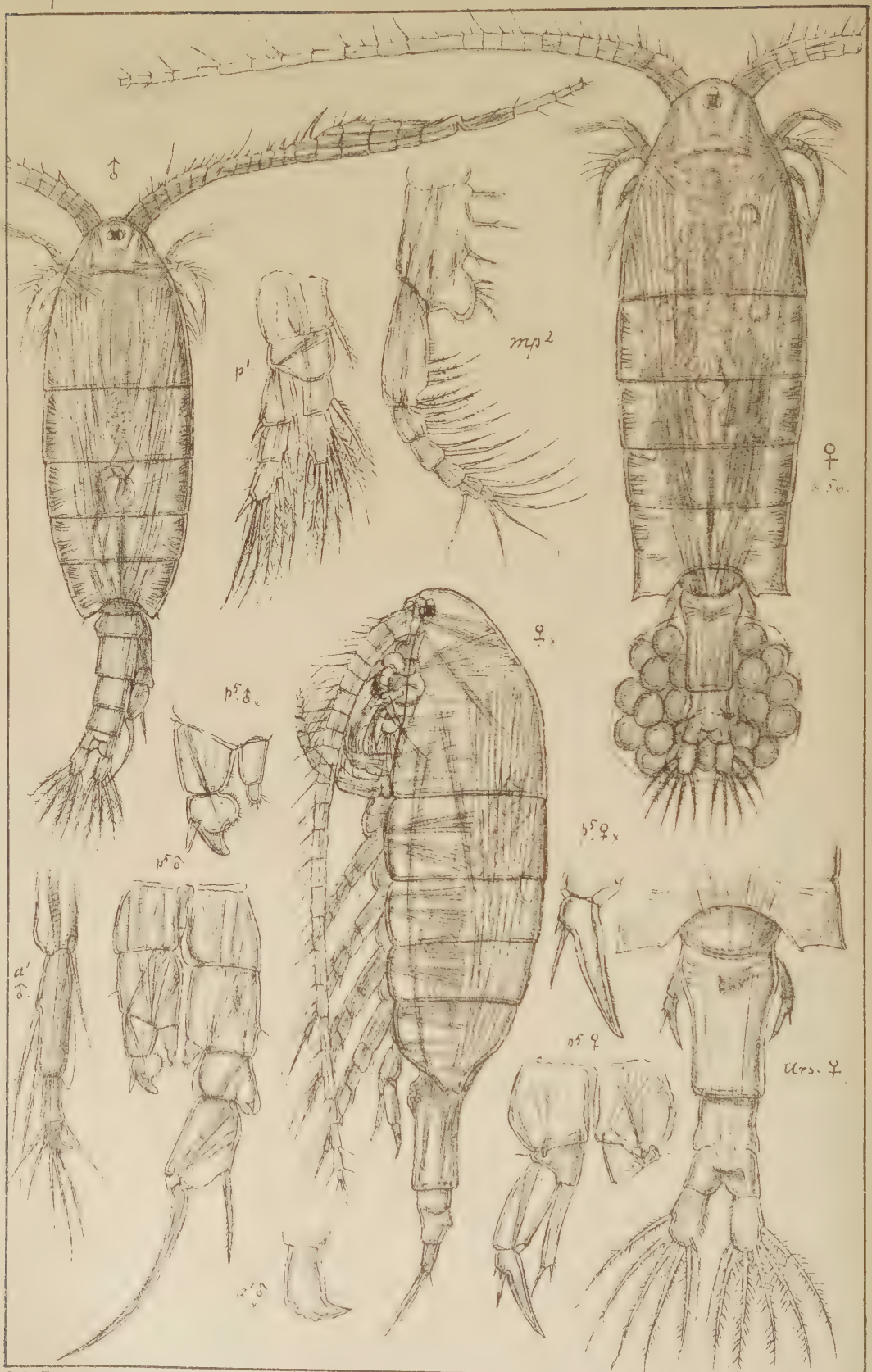
Diaptomus castor (Jurine.)
(continued.)

Copepoda

Calanoida

Diaptomidæ

PI. LIX.

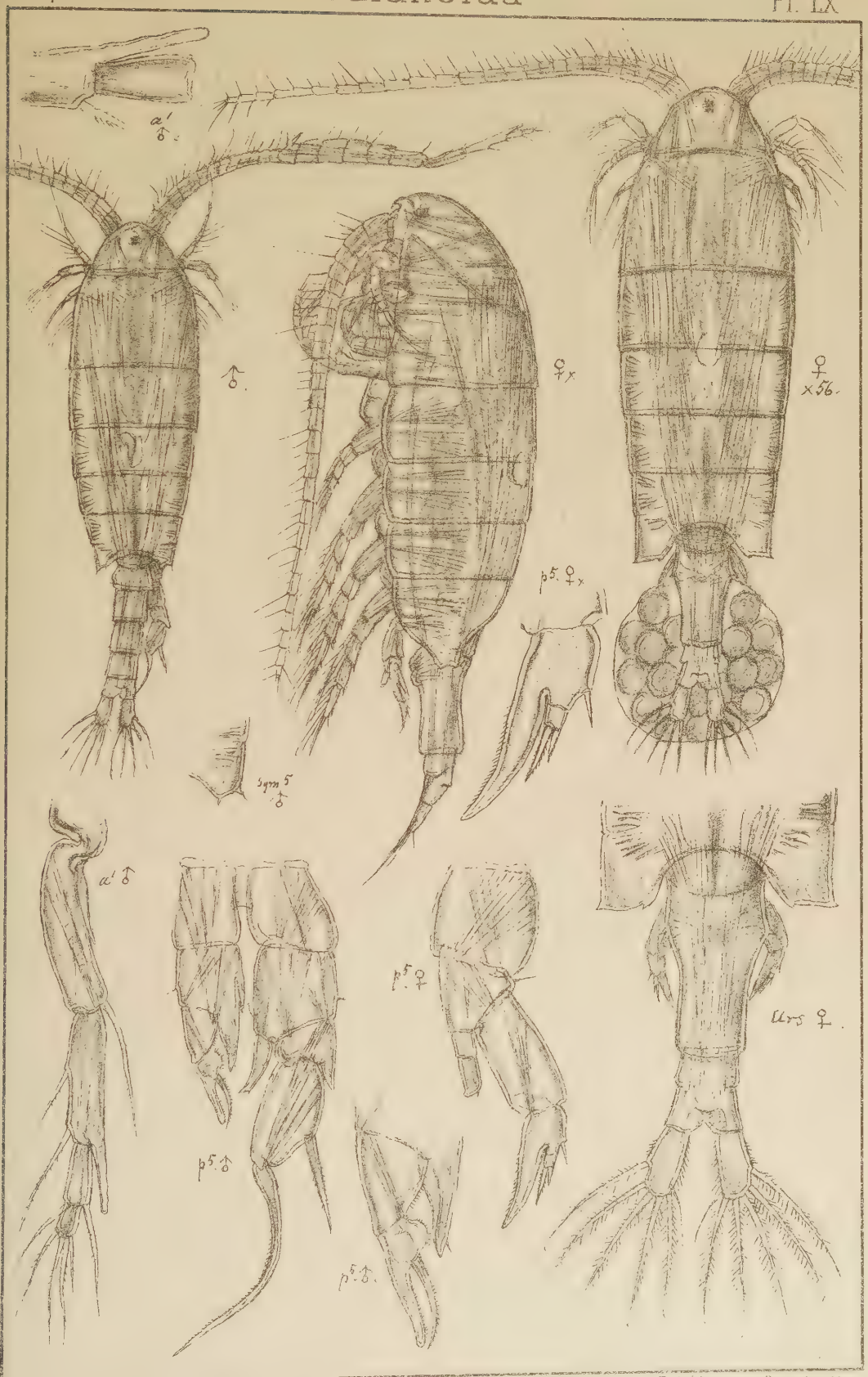


G.O. Sars autogr

Trykt i den private Opmaaling, Chra

Diaptomus denticornis, Wierzejski

Copepoda
Calanoida



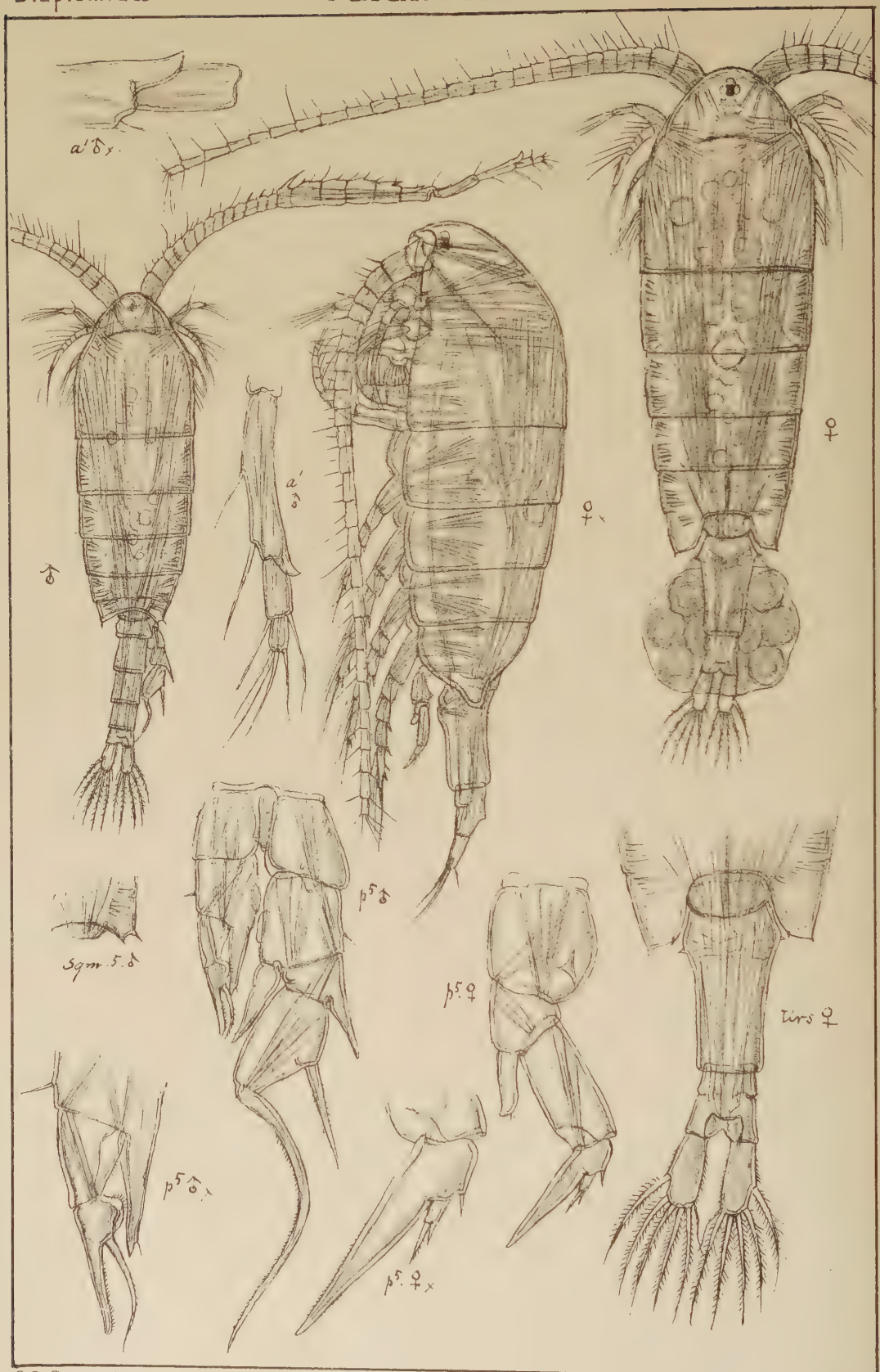
Trykt i den private Opmaaling, Chra

G O Sars autogr

Diaptomus bacillifer Koelbel

Copepoda

Diaptomidæ — Calanoida — Pl. LXI

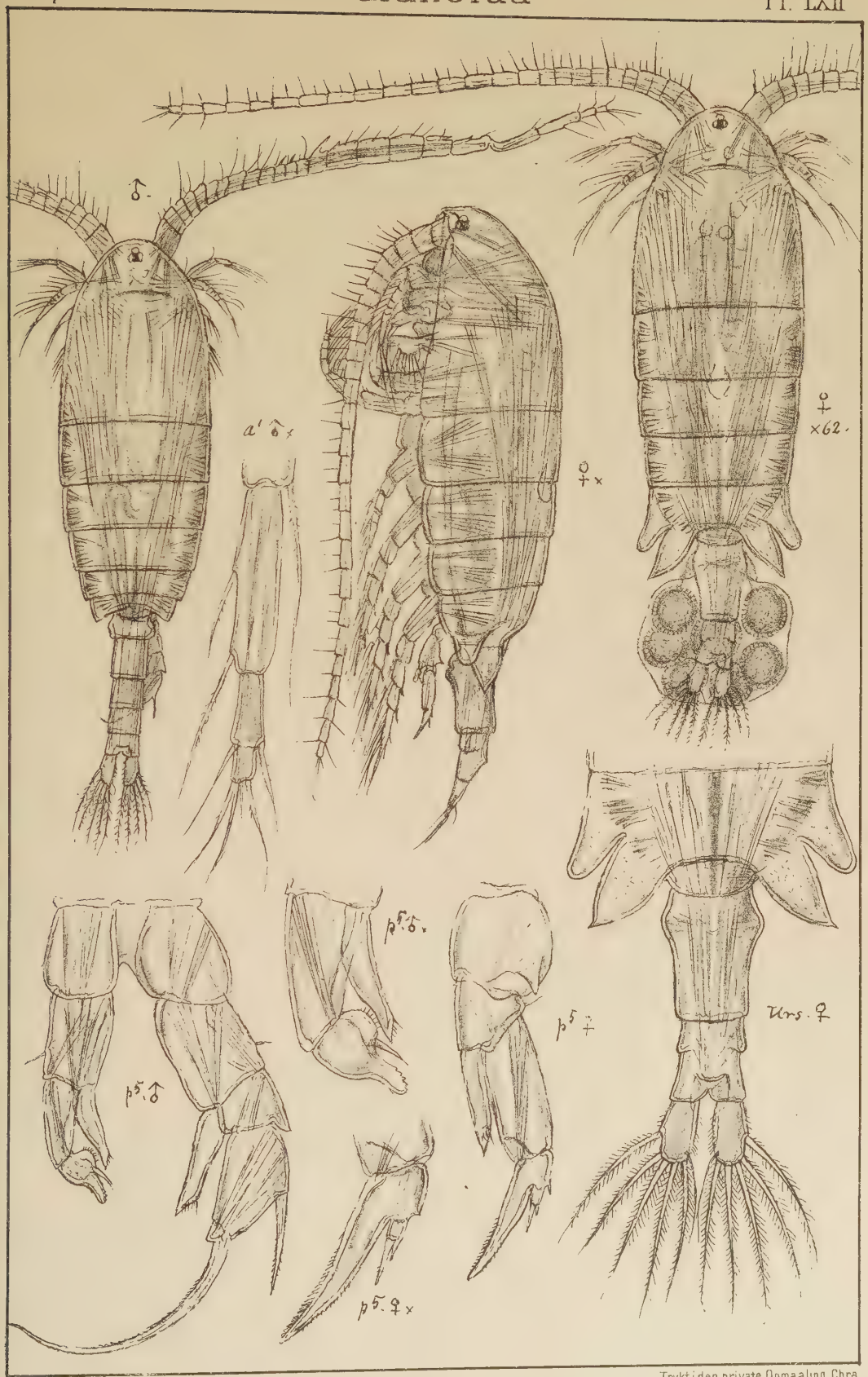


G.O. Sars autogr

Trykt i den private Opmaaling, Chra

Diaptomus laticeps, G.O. Sars.

Copepoda
Calanoida



Trykt i den private Opmaaling, Chra

G O Sars autogr

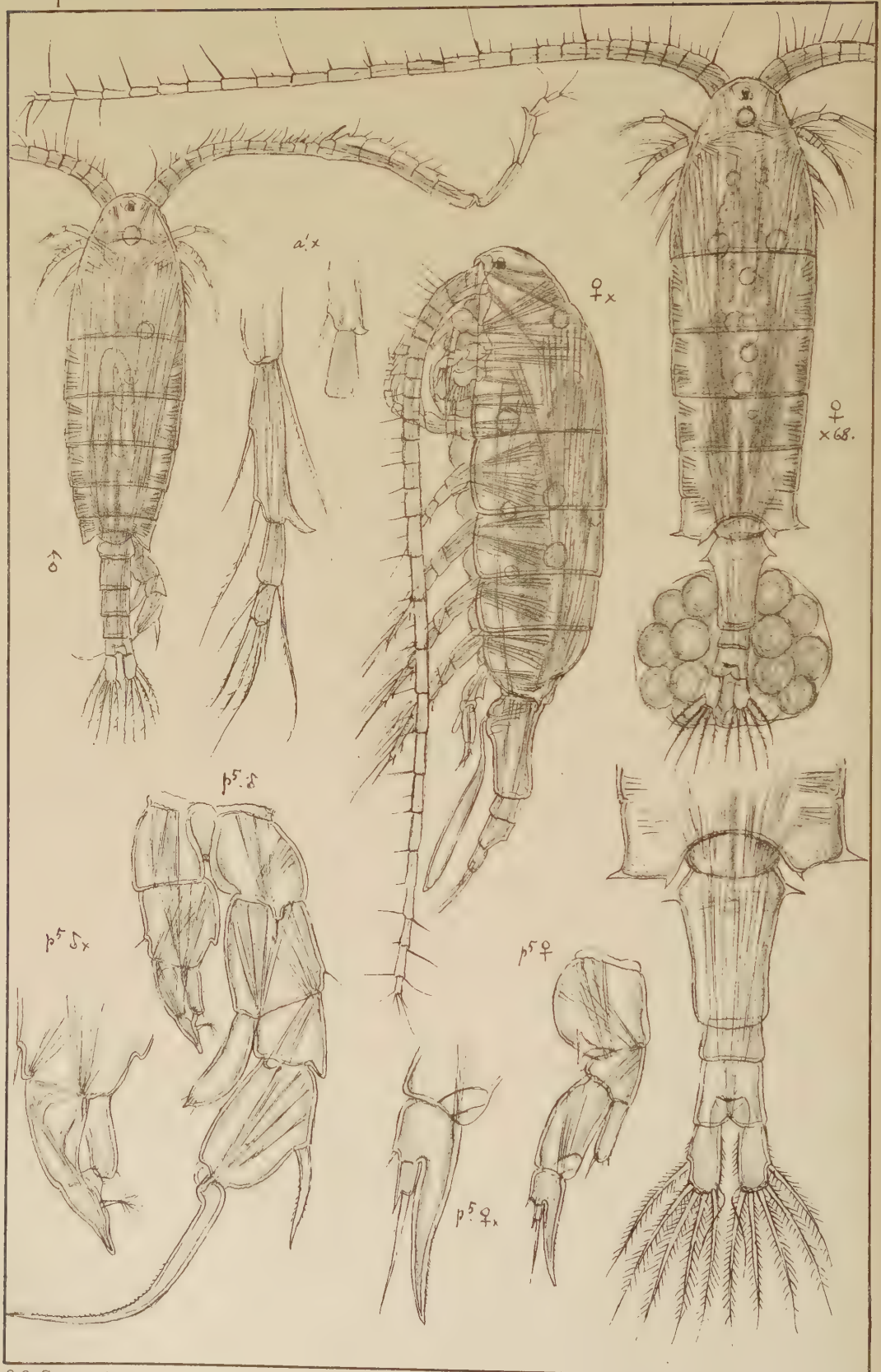
Diaptomus laciniatus, Lilljeb.

Copepoda

Calanoida

Diaptomidæ

PI. LXIII



G O Sars autogr

Trykt i den private Opmaaling, Chra

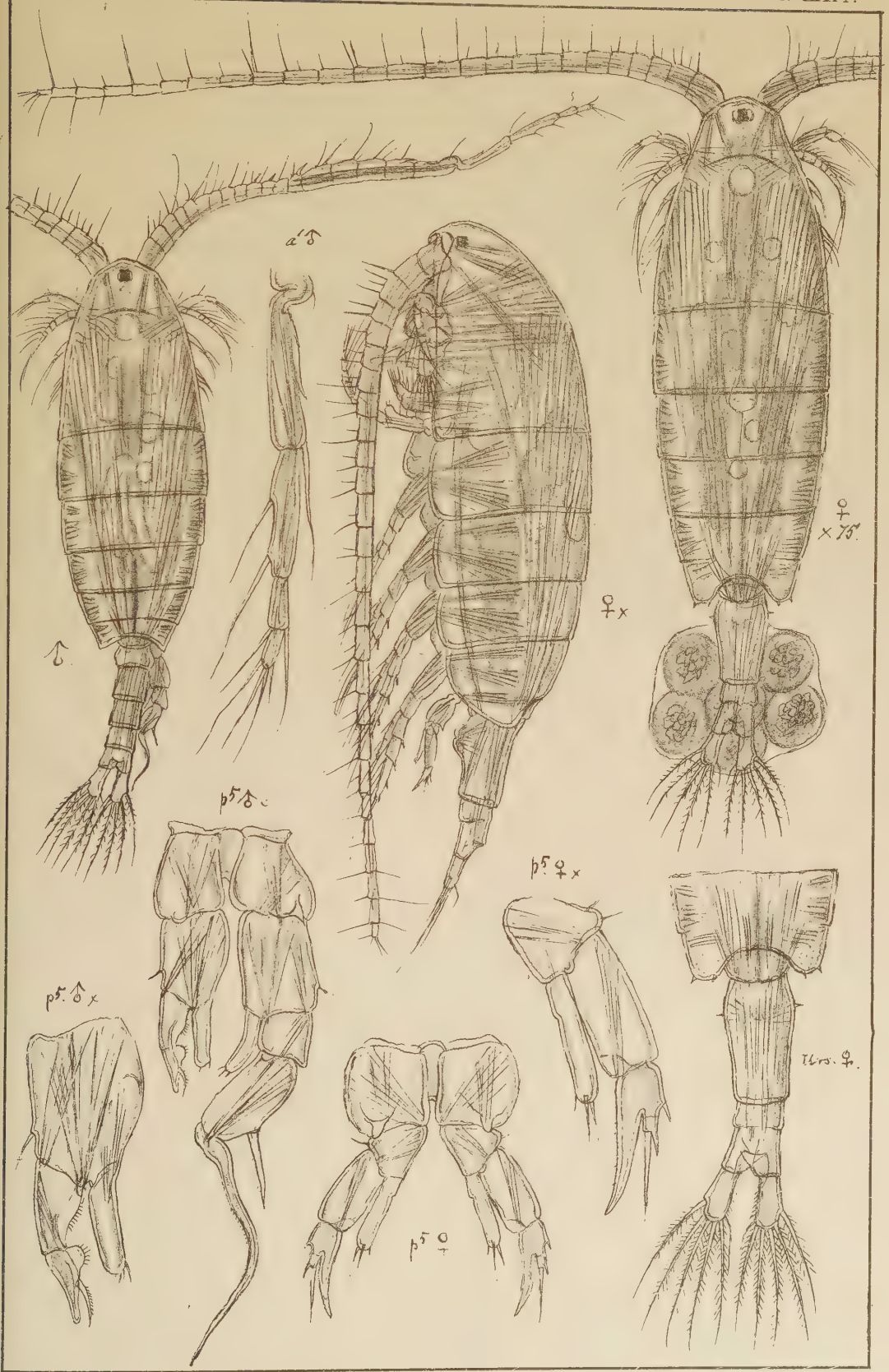
Diaptomus gracilis G.O. Sars.

Copepoda

Calanoida

Diaptomidæ

PI. LXIV.



G.O. Sars autogr.

Tryk i den privatc Opmaaling, Chra

Diaptomus graciloides, Lilljeb

Remarks—The species belonging to this genus may be easily recognized by their unusually short and compact body, and the very slender anterior antennæ and caudal rami. The name *Halitemora* was proposed by Dr. Giesbrecht, to distinguish the marine species of the old genus *Temora* from those occurring in brackish and fresh water, to which the name *Eurytemora* was given, both these groups being at that time considered as only subdivisions (subgenera). As, however, their generic value is now generally accepted, the name *Halitemora* has been replaced by the original name *Temora*, whereas the 2nd name has been retained, to designate a distinct genus, which will be treated of farther on. We know at present of 4 or 5 species belonging to the present genus, all of which are true marine species. One of these belongs to the fauna of Norway, and will be described below.

41. Temora longicornis (Müller).

(Pl. LXV & LXVI).

Cyclops longicornis, O. Fr. Müller. Entomostraca, p. 115.

Syn: *Temora finmarchica*, Baird.
„ *Diaptomus longicaudatus*, Lubbock.
„ *Halitemora longicornis*, Giesbrecht.

Specific Characters.—Female. Anterior division of body, seen dorsally, broadly oval in form, greatest width attaining fully half the length, and occurring quite in front, across the middle of the cephalosome, anterior extremity obtusely rounded, posterior gradually contracted; seen laterally, boldly vaulted above, greatest curvature about in the middle. Cephalosome fully as long as the metasome, front but very slightly produced below, dorsal gibbosity small, but distinct. Lateral parts of last segment of metasome rounded off. Urosome (comprising the caudal rami) somewhat exceeding half the length of the anterior division, genital and anal segments of about equal size, middle segment the smallest. Caudal rami perfectly symmetrical and very narrow, linear, more than twice as long as the anal segment, inner edge finely ciliated, outer edge exhibiting near the base a small ledge; apical setæ unusually short, the innermost but one much the largest and having its base conspicuously dilated, seta of the outer edge occurring at rather a long distance from the others and very delicate, being scarcely at all ciliated. Anterior antennæ, when reflexed, reaching about to the base of the caudal rami. Last pair of legs with the terminal joint about the length of the other 2 combined, and narrow oblong in form, projecting at the end into 4 about equal

denticles, 2 apical and 2 lateral, that of the outer edge distinctly defined at the base.

Male more slender than female, with the anterior division of the body less vaulted, and the urosome considerably longer and narrower. None of the caudal setæ dilated at the base. Right anterior antenna with the middle section moderately tumefied, and exhibiting at the end anteriorly a serrated lamella. Last pair of legs exhibiting the structure characteristic of the genus, left leg more than twice as large as the right, with the 2nd joint greatly dilated and having the thumb-like process long and slender, terminal joint shorter than the penultimate one and scarcely broader, being produced at the tip to an acute projection, outside which a ciliated seta is fixed, inner edge finely ciliated and carrying 2 small spines; right leg with the terminal joint abruptly curved near the base, and carrying outside a strong deflexed spine.

Colour. Body semipellucid, with a faint bluish tinge, and generally exhibiting on the anterior division some few, finely ramified pigmentary patches of a light brown or reddish colour.

Length of adult female 1.50 mm; of male about the same.

Remarks.—This Calanoid was described as early as in the year 1785 by O. Fr. Müller as *Cyclops longicornis*. It was, however, erroneously identified by Baird and subsequent authors with *Monoculus finmarchicus* of Gunnerus, which, as shown above, is a true *Calanus*. The *Diaptomus longicaudatus* of Lubbock seems to be the present species. Though easily recognizable from our other Calanoids, this form exhibits great resemblance to some exotic species, especially to *Calanus turbinatus* of Dana, and, indeed, Mr. Th. Scott considered it to be the very same species. Dr. Giesbrecht, however, who seems to have had an opportunity of examining both these forms, keeps them apart as distinct, though very nearly allied species.

Occurrence.—This is one of our commonest Calanoids, being met with along the whole Norwegian coast, both in the fjords and in the open sea. Off the south and west coasts especially, it is often found in great abundance, forming indeed an essential part of the zoöplankton, and in all probability therefore, having great significance as fish-food. In the Christiania Fjord I have met with it during all seasons, even in the immediate neighbourhood of the town. In habits it is a true pelagic form, occurring as a rule close to the surface of the sea. It moves in a peculiar revolving manner, and this seems to be the case with all the species of this genus, and may have given rise to the specific name *turbinata* applied by Dana to one of them.

Distribution.—British Isles (Brady), coast of France (Canu), Shetland Isles, Iceland (Cleve), Baltic (Giesbrecht), Finnish coast (Nordqvist), Atlantic Coast of North America (Cleve), Atlantic Ocean from lat. 40° to 72° N. (Cleve).

Gen. 16. **Eurytemora,** Giesbrecht, 1881.

Syn: *Temora* (part), Lilljeborg.
„ *Temorella,* Claus.

Generic Characters.—Body of comparatively slender form, with the anterior division far less tumefied than in *Temora.* Cephalosome, as a rule, with a gibbous prominence at the end above, similar to that occurring in *Temora,* front only very slightly prominent, and provided below with 2 extremely small, soft lappets. Last segment of metasome defined from the preceding one by a distinct suture, its lateral parts in some cases greatly expanded. Urosome slender, with the genital segment in female somewhat protuberant below. Caudal rami elongated and slightly divergent, setæ present in the normal number. Eye of moderate size. Anterior antennæ comparatively short, scarcely exceeding in length the anterior division, and in female 24-articulate; right antenna in male distinctly geniculate. Posterior antennæ with the outer ramus longer than the inner, and 7-articulate. Anterior lip rather prominent below. Mandibles, maxillæ and anterior maxillipeds about as in *Temora.* Posterior maxillipeds, however, shorter and stouter, with the 2nd basal joint remarkably dilated, and the terminal part somewhat recurved and clothed with delicate ciliated setæ. Inner ramus of 1st pair of natatory legs uniarticulate, that of the other pairs biarticulate; terminal joint of outer ramus in the latter pairs with only 2 spines outside, apical spine finely denticulate on the outer edge. Last pair of legs in female 4-articulate, penultimate joint produced inside to a strong unguiform process, last joint very small, with 2 unequal spines on the tip; those in male rather large and less asymmetrical than in *Temora,* both legs of nearly same size, 4-articulate, and more or less incurved, terminal joint of right leg claw-shaped, that of left spatulate at the end. Ovisac present in female.

Remarks.—The species of this genus were formerly referred to *Temora;* but in the year 1881 Claus established a new genus, *Temorella,* for their reception. In the same year, and at a somewhat earlier date, Dr. Giesbrecht had proposed another name, viz., *Eurytemora,* and though this name was merely used to designate a subgenus of *Temora,* it has, on account of its earlier date, been preferred

by most recent carcinologists to that given by Claus. The genus, though evidently belonging to the same family as *Temora*, differs very markedly from that genus in several characters, among which may be named the very different structure of the last pair of legs in both sexes. We know at present 7 or 8 species referable to this genus, some of which have been found in brackish water, some in perfectly fresh water, and some both in the sea and in inland lakes. To the fauna of Norway belong 3 species, to be described below.

42. Eurytemora velox (Lilljeborg).

(Pl. LXVII & LXVIII).

Temora velox, Lilljeborg, Crust. de ordinibus tribus in Scania occurrentibus, p. 177, Pl. 20, figs. 2—9 (♀).

Syn: *Cyclopsina lacinulata*, Fischer (not Müller).
„ *Temora Clausii*, Hoek.
„ *Temorella Clausii*, Claus.
„ *Eurytemora lacinulata*, Rich.
„ *Eurytemora Clausii*, Brady.
„ *Temorella lacinulata*, G. O. Sars.

Specific Characters.—Female.—Body moderately slender, with the anterior division, seen dorsally, oblong oval in form, greatest width not attaining half the length, and occurring about in the middle, anterior extremity broadly rounded, posterior scarcely at all contracted; seen laterally only slightly vaulted above. Cephalosome scarcely longer than the 3 succeeding segments combined, and exhibiting at the end above a well-marked knob-like prominence. Lateral parts of last segment of metasome greatly expanded, forming broad posteriorly-extending lamellæ, each terminating in a somewhat outward-curving point, and clothed with delicate sensory hairs. Urosome somewhat exceeding $^2/_3$ of the length of the anterior division, genital segment but slightly dilated in the middle, anal segment of about the same length, and smooth above. Caudal rami but little longer than the anal segment, and clothed both inside and dorsally with delicate hairs; caudal setæ unusually short and conspicuously dilated at the base, that of the outer edge occurring not far from the others. Anterior antennæ, when reflexed, reaching about to the end of the anterior division of the body, and rather richly supplied with bristles. Last pair of legs with the penultimate joint armed outside with a single spine only, claw-like process comparatively short and distinctly denticulated outside, extending obliquely backwards. Ovisac large, rounded.

Male considerably more slender than female, and having the lateral parts of last segment of metasome simple, rounded. Urosome rather narrow and

elongated; caudal rami equalling in length the last 2 segments combined, and having the apical setæ more elongated than in female. Right anterior antenna rather strongly built, with the middle section considerably tumefied. Last pair of legs with the 2nd joint but slightly dilated, terminal joint of both legs exhibiting a slight median subdivision, that of left leg terminating in 2 obtuse lobes.

Colour. Body more or less pellucid, in some cases, however, tinged with yellowish brown.

Length of adult female reaching to 2.20 mm., that of male to 1.85 mm.

Remarks.—This form was first described (in the year 1853) by Seb. Fischer under the name of *Cyclopsina lacinulata,* being regarded as identical with O. Fr. Müller's *Cyclops lacinulatus,* which, however, is evidently a very different form, and is probably referable to *Diaptomus castor* Jurine. The same species was subsequently observed by Prof. Lilljeborg, who described it as a new species of the genus *Temora* (T. velox). It is, however, only the female that is referable to the present species, whereas the male described by Prof. Lilljeborg belongs to another nearly-allied species, to be described farther on. The *Temora Clausii* of Hoek is unquestionably the present form. It is the largest of the known species, and moreover easily recognizable, at any rate in the female sex, by the peculiar form of the lateral expansions of the last segment of the metasome, as also by the less elongated caudal rami.

Occurrence.—I have found this form rather abundantly in small pools on 2 islands lying off Arendal. The pools were located at only a short distance from the shore, and it is very probable therefore that at times the water is mingled with sea-spray. This is evident from the circumstance that in the same pools the well-known Harpacticid, *Tigriopus fulvus* Fischer, occurred very plentifully. I have, however, met with this Calanoid also in perfectly fresh water, for instance in the Vansjø at Moss, and in tranquil creeks of the river Glommen (at Nipen), many miles from its mouth. The specimens in these places, however, were of far inferior size to those found in the brackish pools, and also much more pellucid. The animal moves very rapidly in abrupt bounds, and thus fully deserves the specific name given to the species by Prof. Lilljeborg.

Distribution.—Russia (Fischer), Germany (Schmeil), Britany (Brady), France (Richard), Holland (Hoek), Skåne (Lilljeborg), the Baltic (Nordqvist), fresh-water estuaries of the Caspian Sea (the present author).

43. Eurytemora hirundoides (Nordqvist).

(Pl. LXIX).

Temorella affinis, var. *hirundoides*, Nordqvist. Die Calaniden Finlands, p. 48, Pl. IV, figs. 5—11; Pl. V, fig. 5.

Syn: *Temora velox*, Lilljeborg ♂.
„ *Temora inermis*, Boeck (immature).

Specific Characters.—Female.—Body exceedingly slender, with the anterior division, seen dorsally, narrow oblong in form, greatest width about equalling $^1/_3$ of the length, and occurring somewhat in front of the middle, anterior extremity narrowly rounded, posterior slightly contracted. Cephalosome somewhat exceeding in length the 3 succeeding segments combined, and exhibiting a well-marked dorsal prominence behind. Last segment of metasome with the lateral parts expanded into triangular, somewhat divergent lamellæ, which, however, do not extend as far as the genital segment. The latter somewhat dilated in the middle, and abruptly contracted behind. Anal segment fully as long as the genital segment, and clothed dorsally with delicate spikes. Caudal rami very slender and elongated, somewhat exceeding in length the last 2 caudal segments combined, and, like the anal segment, clothed dorsally with delicate spikes, apical setæ comparatively more elongated than in *E. velox,* that of the outer edge situated at rather a long distance from the others. Anterior antennæ, when reflexed, reaching scarcely to the end of the anterior division. Natatory legs considerably more slender than in *E. velox,* otherwise of same structure. Last pair of legs with the penultimate joint armed outside with 2 slender spines, unguiform process comparatively larger than in *E. velox,* and quite smooth, extending obliquely backwards. Ovisac large, oblong oval in form.

Male still more slender than female, and, as usual, having the last segment of metasome simple, not expanded laterally. Right anterior antenna with the middle section considerably tumefied. Last pair of legs with the 2nd joint on both sides conspicuously dilated, exhibiting inside a rounded expansion, terminal joint without any median subdivision, that of right leg conspicuously dilated at the base, that of left leg terminating in 3 lobules with a hollow space between them.

Colour.—Body in both sexes highly pellucid and almost colourless.

Length of adult female reaching to 1.15 mm.

Remarks.—This form has generally been considered as only a variety of *E. affinis,* Poppe. In my opinion, however, it ought to be specifically distinguished with fully as much reason as the 3 forms, *E. hirundo,* Giesbrecht, *E. lacustris,* Poppe, and *E. gracilis,* G. O. Sars. All the 4 species are certainly very closely

related, and in all probability stand in a close genealogical relation to each other; but as long as no distinct transitions between them have been demonstrated to exist, they must be kept apart. The true *E. affinis*, Poppe, of which I have had specimens for examination, is a much more robust form, and differs moreover, at any rate in the female sex, in the larger size of the lateral expansions of the last segment of the metasome, as also in the shape of the genital segment. The specimen described by Prof. Lilljeborg as the male of his *Temora velox*, is undoubtedly referable to the present species, and this is also the case with the form recorded by Boeck as *Temora velox*, and that named *T. inermis*, the latter supposed species being only founded on immature specimens, in which the lateral expansions of the last segment of the metasome have not yet been formed.

Occurrence.—I have found this form both in the sea and in brackish lakes and ditches round the greater part of the Norwegian coast. On the other hand, I have never met with it in perfectly fresh water. At the Zoological Station at Dröbak, it is often taken close to the shore in comparatively salt water, and I have also occasionally found it in plankton-samples taken in the Brevik Fjord. I have come across it in quite extraordinary abundance in a brackish lake at Kolvereid, Namdal, and this is the most northerly place where I have observed it.

Distribution.—Skåne (Lilljeborg), Finnish coast (Nordqvist).

44. Eurytemora lacustris, Poppe.

(Pl. LXX).

Temorella lacustris, Poppe, Zeitschr. f. wiss. Zool. Vol. 45, p. 278, Pl. 15, figs. 10—13.

Syn: *Temorella intermedia*, Nordqvist.

Specific Characters.—Female. Body somewhat less slender than in *E. hirundoides*, with the anterior division, seen dorsally, oblong oval in form, greatest width exceeding $^1/_3$ of the length and occurring quite in front, across the middle of the cephalosome, anterior extremity rounded, posterior somewhat contracted. Cephalosome occupying about half the length of the anterior division, and exhibiting in the middle dorsally a slight cervical depression, and at the end a well-marked knob-like prominence. Last segment of metasome scarcely at all expanded laterally. Urosome rather slender, genital segment but slightly dilated in the middle, anal segment fully as long, but much narrower, and perfectly smooth above. Caudal rami not quite attaining the length of the 2 preceding segments combined, but like them smooth above; setæ of moderate length, that of the outer edge scarcely shorter than the others, and situated at rather a long

distance from them. Anterior antennæ, when reflexed, reaching to about the end of the anterior division of the body. Natatory legs exactly as in *E. hirundoides*. Last pair of legs with the penultimate joint armed outside, as in *E. hirundoides*, with 2 spines, which however are considerably shorter; outer apical spine likewise shorter than in the said species; unguiform process rather strong and extending straight inwards, at a right angle with the axis of the leg. Ovisac of moderate size, rounded.

Male resembling that of *E. hirundoides*, but differing slightly in the structure of the last pair of legs, the 2nd joint of which is less dilated; terminal joint of right leg very slender, being scarcely at all dilated at the base, that of left leg terminating in 2 rounded lobes.

Colour.—Body in both sexes highly pellucid and almost colourless.

Length of adult female 1.30 mm.

Remarks.—This form was first described by Poppe as *Temorella lacustris*, and was subsequently recorded by Nordqvist under another specific name, viz., *T. intermedia*. It is closely allied to *E. hirundoides*, though differing conspicuously in the simple structure of the last segment of the metasome, which does not form any lamellar expansions in the adult female. Moreover the delicate spikes with which the anal segment and the caudal rami in *E. hirundoides* are clothed, are wanting here. Finally, the last pair of legs exhibit in both sexes some small differences referred to in the above diagnosis.

Occurrence.—I have hitherto only found this form in a single locality, viz., in the Femsjö, where some few specimens were captured. It is never found except in perfectly fresh water; hence the specific name proposed by Poppe.

Distribution.—Sweden (Lilljeborg), northern Germany (Poppe), Finland (Nordqvist), Ladoga (idem).

Gen. 17. **Heterocope**, G. O. Sars, 1863.

Generic Characters.—Body more or less robust, with the anterior division moderately vaulted above. Cephalosome somewhat expanded in the middle and having above a distinct cervical depression, front quite unarmed below. Last segment of metasome confluent with the preceding one, and without any lateral expansions. Urosome moderately slender, genital segment in female much the largest and more or less protuberant below. Caudal rami comparatively short

and broad, transversely truncated at the tip, setæ much reduced in number, only 3 on each ramus being fully developed. Eye rather large and situated far forward. Anterior antennæ slender, and composed in female of 25 articulations, the last rather small, but well defined from the preceding one; right anterior antenna in male geniculate. Posterior antennæ with the outer ramus much narrower than the inner, and composed of 6 joints only. Anterior lip comparatively large and broad, with the median lobe densely hairy. Mandibles with the cutting teeth simple, not bidentate, palp with the inner ramus much longer than the outer. Maxillæ normal. Maxillipeds rather strongly built, the anterior ones with the terminal appendages claw-like, though comparatively short; the posterior ones with the 1st basal joint comparatively broad, and carrying anteriorly unusually strong setæ, terminal part composed of 4 joints only. Inner ramus of all the natatory legs very small and uniarticulate, terminal joint of outer ramus with only 2 spines outside, apical spine in 2nd to 4th pairs coarsely serrate on the outer edge. Last pair of legs in female 4-articulate, 1st joint confluent with that on the other side, terminal joint of different form in the different species and coarsely dentate, apical denticle generally much elongated and claw-like; those in male on the whole built upon the same type as in the genus *Temora*, the left leg being much the larger, and having a long curved, thumb-like process issuing from inside the 2nd joint. Ovisac in female wanting, or at any rate imperfectly developed.

Remarks.—This genus was established in the year 1863 by the present author, to comprise 2 Norwegian fresh-water Calanoids, one of which had been described at a somewhat earlier date by Prof. Lilljeborg as a species of *Diaptomus*. The genus is unquestionably referable to the family *Temoridæ*, as here defined, the last pair of legs in particular exhibiting an evident resemblance in their structure to those in the typical genus *Temora*. Yet this genus is clearly characterised both from *Temora* and the other genera comprised in this family by several pecularities, among which may be mentioned the rudimentary condition of the inner ramus of the natatory legs, a character which has given rise to the generic name. We know at present 4 species of this genus, one of which has been found in the Caspian Sea, whereas the other 3 are true fresh-water forms. These 3 species belong to the fauna of Norway, and will be described below.

45. Heterocope saliens (Lilljeborg).

(Pl. LXXI & LXXII).

Diaptomus saliens, Lilljeborg. Öfvers. Vet. Akad. Förh. Vol. 19, p. 395, Pl. 3, figs. 18—31.

Syn: *Heterocope robusta*, G. O. Sars.
„ — *alpina*, G. O. Sars (immature).
„ — *romana*, Imhof.

Specific Characters.—Female. Body comparatively robust, with the anterior division, seen dorsally, oblong oval in form, greatest width not attaining half the length, and occurring about in the middle, anterior extremity abruptly contracted and obtusely truncated at the tip, posterior slightly attenuated. Urosome scarcely attaining half the length of the anterior division, genital segment about the length of the other 2 combined, and having the genital protuberance simple, without any spines or appendages, anal segment shorter than the middle one. Caudal rami about the length of the anal segment, and scarcely widening distally, each carrying outside the 3 apical setæ a small unciliated bristle, not attaining the length of the ramus. Anterior antennæ, when reflexed, reaching somewhat beyond the 2nd caudal segment. Last pair of legs with the terminal joint considerably dilated, lamellar, carrying outside 2 spinules, inside 4 distinctly bidentate denticles, apical spine very long and coarsely denticulate in its distal part.

Male of about the same size as the female, and not very different in shape, though the urosome is comparatively more slender, and, as usual, 5-articulate. Right anterior antenna with the middle section but slightly tumefied. Natatory legs of same structure as in the female. Right last leg with the outer 2 joints well defined, and together about the length of the antepenultimate one, the latter without any protuberance of the inner edge; terminal joint of left leg oblong oval in form, about 3 times as long as it is broad, and finely ciliated inside, inner apical spine rather elongated.

Colour.—Body generally of a beautiful ultramarine hue, antennæ, oral parts and urosome often tinged with dark orange.

Length of adult female about 3 mm.

Remarks.—As stated above, this form was first described by Prof. Lilljeborg as *Diaptomus saliens*, and the same form was somewhat later recorded by the present author under the name of *Heterocope robusta*, Prof. Lilljeborg's paper being at that time unknown to him. The *Heterocope romana* of Imhof is unquestionably the same species, and this is also the case with the form recorded by the present author as *H. alpina*, which was only founded on immature specimens of *H. saliens*. It may be regarded as the type of the present genus.

Occurrence.—I have met with this beautiful Calanoid in many places in Norway, in the lowland, and especially in the mountain lakes. According to the recent investigations of Mr. Huitfeldt-Kaas, it is generally distributed in almost all the lakes of the western part of Norway, and it has been found occasionally by Mr. Rabot in the great lake Rösvand in Nordland. The most northerly place where I have met with it, is at Bodö, located somewhat north of the Arctic Circle. As a rule, it is found as a true limnetic form in larger lakes, where it constitutes an essential food of the trout; but occasionally it also occurs in comparatively small tarns and ditches. It moves in a peculiar jerky manner, chiefly by rhythmical strokes of the posterior antennæ, only now and then making a quick bound by employing its natatory legs and urosome. The specific name proposed by Prof. Lilljeborg refers to this peculiar motion.

Distribution.—Lakes of Sweden (Lilljeborg), Russia (Poggenpol), central Germany (Gruber, etc.), Bohemia (Fric), North Italy (Pavesi), Switzerland (Imhof).

46. Heterocope borealis (Fischer).

(Pl. LXXIII).

Cyclopsina borealis, Fischer, in „Middendorf's Sibirische Reise". Zool. p. 158. Pl. VIII, figs. 40—46.

Syn: *Heterocope robusta*, Gruber (not G. O. Sars).
„ — *saliens*, Nordqvist (not Lilljeborg).
„ — *Weismanni*, Imhof.

Specific Characters.—Female. Body considerably more robust than in the preceding species, with the anterior division, seen dorsally, oval in form, greatest width nearly attaining half the length, and occurring about in the middle. Urosome about the length of the metasome, genital segment fully as long as the other 2 combined, hind part of genital area with a slight incurved dentiform projection on each side, anal segment shorter than the middle one. Caudal rami short and broad, widening distally, and slightly divergent, apical setæ conspicuously dilated at the base, the middle one somewhat longer than the other 2, bristle outside them comparatively larger than in *H. saliens,* attaining the length of the caudal rami. Anterior antennæ, when reflexed, reaching but little beyond the genital segment. Last pair of legs with the terminal joint comparatively narrower than in *H. saliens,* and having the denticles of the inner edge less distinctly bidentate, apical spine very slender.

Male resembling that of *H. saliens,* but more robust of form, with the middle section of right anterior antenna more tumefied. Outer ramus of 2nd to

4th pairs of legs peculiarly transformed on right side. Last pair of legs on the whole resembling those in the male of *H. saliens*, though exhibiting some small differences: right leg with the 2nd joint produced inside to a knob-like prominence, the last 2 joints imperfectly defined from each other; left leg with the terminal joint comparatively narrower and more elongated, exceeding in length the 2 preceding joints combined.

Colour.—Body generally of a dark olivaceous hue, anterior antennæ and caudal rami tinged with reddish brown.

Length of adult female somewhat exceeding 3 mm.

Remarks.—There cannot in my opinion be any doubt that this is the *Cyclopsina borealis* originally described by Seb. Fischer, since, as shown by the present author, it is the only species of *Heterocope* occurring in the tract from which Fischer received his material. Owing to the imperfect description given by that author, it was not recognized, however, by subsequent carcinologists, and in the year 1890 it was re-described by Dr. Imhof as a new species under the name of *H. Weismanni*. By some other authors (Nordqvist, Gruber) it was confounded with *H. saliens*, Lilljeb., to which species it certainly bears a great resemblance. On a closer comparison, however, it may be easily distinguished by its considerably more robust body, the comparatively shorter anterior antennæ, and also by some slight differences in the structure of the caudal rami and the last pair of legs in both sexes. A character quite peculiar to the present species, and not found in any other known Calanoid, has been first pointed out by Dr. Gruber, viz., the peculiar transformation in the male of the outer ramus on the right side of the 2nd to 4th pairs of legs. This transformation is perfectly constant, and will alone suffice to distinguish the male of the present species.

Occurrence.—I have only met with this form in the eastern part of Finmark, where it seems to be generally distributed in small tarns and ditches. It occurs in this way in great abundance on the mainland opposite Vardö, as also at Matsjok, an affluent to the river Tana. In habits it agrees with *H. saliens*, moving in a similar jerky manner.

Distribution.—Siberia, in the rivers Taimyr and Boganida (Fischer), Iana territory, New Siberian Islands, territory of Akmolinsk (the present author), Kola Peninsula and Nova Zembla (Lilljeborg), Bodensee (Imhof).

47. Heterocope appendiculata, G. O. Sars.

(Pl. LXXIV).

Heterocope appendiculata, G. O. Sars. Oversigt af de indenlandske Ferskvandscopepoder. Chr. Vid. Selsk. Forh. 1862, p. 15.

Specific Characters.—Female. Body considerably more slender than in the 2 preceding species, with the anterior division, seen dorsally, oblong in form, greatest width but slightly exceeding $^1/_3$ of the length, and occurring somewhat in front of the middle. Urosome exceeding half the length of the anterior division, genital segment shorter than the other 2 combined, and carrying in front of the genital orifice a transverse row of 8 peculiar, reflexed appendages; anal segment longer than the middle one. Caudal rami about twice as long as they are broad, bristle at the outer corner wanting, and replaced by a slight dentiform projection. Anterior antennæ very slender and elongated, reaching, when reflexed, beyond the caudal rami. Last pair of legs with the terminal joint very narrow, denticles of the inner edge simple, apical spine very slender.

Male still more slender than female, and having the middle section of right anterior antenna only slightly tumefied. Last pair of legs differing conspicuously from those in the 2 preceding species, right leg rather produced and peculiarly contorted, having the 3 outer joints confluent into a falciform piece; left leg with the thumb-like process bulbously dilated at the tip, terminal joint rather narrow, with the apical spine quite short.

Colour.—Body semipellucid and generally of a light bluish green hue, anterior antennæ and urosome in male tinged with orange.

Length of adult female 2.20 mm.

Remarks.—This species may at once be distinguished from the 2 preceding ones by its more slender form of body, the greatly elongated anterior antennæ, and the peculiar appendages occurring in front of the female genital orifice, the latter character having given rise to the specific name. It is also rather inferior in size to the other 2 Norwegian species, and exhibits a somewhat different structure in the last pair of legs.

Occurrence.—In the southern part of Norway, this species is by far the commonest, occurring in great abundance in almost all the larger lakes, and there constituting an essential part of the food of several fresh-water fishes. In the northern and western parts of the country, as also in the mountain lakes, its place is taken by *H. saliens,* with which it agrees perfectly in habits.

Distribution.—Sweden (Lilljeborg), Finland (Nordqvist), Ladoga (idem), Northern Germany (Zacharias), Russian Lapland (Richard).

Fam. 16. Metridiidæ.

Characters.—Body of comparatively slender form, with the cephalosome well defined from the 1st pedigerous segment, front somewhat produced and carrying below 2 delicate, ciliated filaments. Last 2 segments of metasome united. Urosome more or less elongated, and consisting in female of 3, in male of 5 segments. Caudal rami comparatively broad, flattened, with the full number of setæ. Eye very small, subventral. Anterior antennæ moderately slender, and consisting in female of 24 articulations, the 7th and 8th being united; left antenna in male, as a rule geniculate, and richly supplied with sensory appendages. Posterior antennæ and oral parts on the whole normal. The 4 anterior pairs of legs with both rami 3-articulate, outer ramus of 2nd to 4th pairs very large, more or less lamellar, with comparatively short spines, 3 of which occur outside the terminal joint. Inner ramus of 2nd pair with the 1st joint peculiarly transformed. Last pair of legs simple, not natatory, being very small in female, in male, as usual, somewhat larger and prehensile, right leg the larger. No ovisac present in female.

Remarks.—In this new family I propose to include the 2 nearly-allied genera *Metridia*, Boeck and *Pleuromamma*, Giesbrecht. These genera, it is true, in some respects apparently exhibit a close resemblance to the *Temoridæ*; but the structure of the natatory legs is essentially different, and more resembles that in the next family *(Heterorhabdidæ)*. With this family they also agree in the circumstance that the left anterior antenna in the male is generally prehensile. Finally, a peculiarity, not mentioned in the above diagnosis, may be here named, viz., the luminous power of the animal, when alive. This power seems to be common to all the Metridiidæ, whereas it has not been observed in any other Calanoids. In one of the genera *(Pleuromamma)*, a special luminous organ is present, and though this organ is wanting in *Metridia*, all the species of that genus observed in the living state, have been found to emit light when disturbed. Both genera are represented in the fauna of Norway, and will be treated of below.

Gen. 18. **Metridia**, Boeck, 1864.

Generic Characters.—Body slender and elongated, with the anterior division only slightly tumefied. Cephalosome without any cervical depression above, rostral projection smooth in front, tentacular filaments very slender. Lateral

parts of last segment of metasome not expanded, though in some cases angular at the tip. Urosome narrow and elongated, genital segment scarcely at all protuberant below, anal segment slightly widening distally. Caudal rami flattened, with the setæ comparatively short, one of them attached to the outer edge, at some distance from the others. No special luminous organ present. Anterior antennæ conspicuously attenuated, with some of the proximal joints projecting into small denticles, last joint very small, but well defined from the preceding one, which carries anteriorly an unusually long and slender bristle; prehensile antenna of male (generally the left) with the sensory appendages of moderate size and uniform appearance. Posterior antennæ with the outer ramus scarcely longer than the inner, and 6-articulate. Anterior lip somewhat prominent, and defined in front by a slight sinus. Posterior maxillipeds very slender, with the terminal part 5-articulate and longer than the 2nd basal joint. Inner ramus of 2nd to 4th pairs of legs about half the length of the outer, its terminal joint with 2 setæ on the outer edge, 1st joint in 2nd pair with strong hamiform processes inside; outer ramus of these pairs moderately dilated, with the apical spine well developed and finely denticulate on the outer edge; its 1st joint in 3rd pair somewhat larger than in the other pairs, and having a small incision at the end outside. Last pair of legs in female 3- or 4-articulate, with slender setæ at the tip; those in male 5-articulate and more or less strongly incurved, right leg with the terminal joint but slightly dilated, antepenultimale joint, as a rule, with a slender spiniform process inside.

Remarks.—This genus was established in the year 1864 by Boeck, to comprise 2 Norwegian species, and its near relation to the genus *Pleuromma* of Claus (= *Pleuromamma,* Giesbr.) was at the same time mentioned. The chief distinction between these 2 genera consists in the presence or absence of a special luminous organ, the latter being constantly found in the genus *Pleuromamma,* whereas in *Metridia* no such organ exists. In addition to this character, some other differences may, on a closer comparison, be demonstrated to exist, justifying the separation of these 2 genera, the more so as several species of each of them have been found. We know at present no less than 9 species referable to the present genus, 2 of which belong to the Norwegian fauna and will be described below.

48. Metridia longa (Lubbock).

(Pl. LXXV & LXXVI).

Calanus longus, Lubbock. On some Arctic Species of Calanidæ, Ann. nat. hist., ser. 2, Vol. 14, p. 127, Pl. 5, fig. 10.

Syn: *Metridia armata*, Boeck.

Specific Characters.—Female. Body exceedingly slender, with the anterior division, seen dorsally, oblong in form, greatest width but slightly exceeding $^1/_3$ of the length, and occurring about in the middle, anterior extremity somewhat contracted and narrowly rounded at the tip, posterior gradually attenuated. Cephalosome much shorter than metasome, and having the dorsal face quite evenly vaulted, rostral projection somewhat prominent. Lateral parts of last segment of metasome rounded off at the tip. Urosome very slender, exceeding in length the metasome, genital segment about the length of the other 2 combined, and only very slightly dilated in front. Caudal rami comparatively large, fully as long as the anal segment, and somewhat widening distally, apical setæ rather short, the innermost but one the longest, seta of the outer edge occurring at about $^2/_3$ of the length of the caudal ramus. Anterior antennæ, when reflexed, reaching about to the middle of the genital segment, 1st, 2nd, 4th, 5th, 6th and 10th joints each produced at the end anteriorly to a small dentiform projection. Last pair of legs distinctly 4-articulate, last joint the smallest, and carrying 3 slender ciliated setæ, the innermost the longest, and extending obliquely inwards.

Male rather smaller than female and still more slender, with the urosome very narrow and elongated. Left anterior antennæ (more rarely the right) geniculate, with the middle section only slightly tumefied. Last pair of legs exhibiting the structure characteristic of the genus, terminal joint of both legs oblong in form, with the distal part somewhat contracted, spiniform process of antepenultimate joint of right leg rather elongated, slightly sigmoid and finely denticulated on one side distally.

Colour.—Body in both sexes highly pellucid, almost hyaline, sometimes with a slight brimstone-coloured shade on the anterior part of the cephalosome.

Length of adult female reaching to 4.30 mm., of male to 3.70 mm.

Remarks.—This form was described, though rather imperfectly, by Lubbock in the year 1854 as *Calanus longus*. The same form was subsequently found off the Norwegian coast by Boeck, who describes it as *Metridia armata*, the specific name being probably derived from the dentiform projections which some of the articulations of the anterior antennæ form in front. It may be regarded

as the type of the genus, and is easily recognizable from most other Calanoids by its very slender and elongated form.

Occurrence.—I have met with this form along the whole Norwegian coast, from the Christiania Fjord to Vadsö, but as a rule only in greater depths, below 100 fathoms. This form often occurs in great abundance, especially in the deep fjords; and it was also found rather frequently in some of the samples of plankton taken from deep water in the open sea during the cruise of the "Michael Sars". In the living state it is so exceedingly pellucid, that in spite of its comparatively large size, it is not easy to detect. It moves in the usual manner, now proceeding at quite an even rate by rapid vibrations of the posterior antennæ, now jumping along abruptly by powerful strokes of the natatory legs and urosome. When disturbed, it sends out from its body a bright flash of a bluish colour. This flash is so intense, that even by full day-light it can easily be seen.

Distribution.—Faroe Channel (Norman), Baffin's Bay (Hansen), Spitsbergen (Lilljeborg), the Kara Sea (Hansen), Polar basin crossed by Nansen (the present author), Atlantic Ocean from lat. 56° to 76° N. (Giesbrecht).

49. Metridia lucens, Boeck.

(Pl. LXXVII).

Metridia lucens, Boeck. Oversigt over de ved Norges Kyster forekomne Copepoder. Chr. Vid. Selsk. Forh. 1864, p. 238.

Syn: *Metridia armata*, Brady (not Boeck).
„ *Paracalanus hibernicus*, Brady & Roberts.
„ *Metridia hibernica*, Giesbrecht.

Specific Characters.—Female. Body somewhat less slender than in the preceding species. Cephalosome about the length of the metasome, and remarkably vaulted above in the middle, rostral projection less prominent than in *M. longa*. Lateral parts of last segment of metasome acutangular at the tip. Urosome comparatively shorter than in *M. longa*, genital segment not attaining the length of the other 2 combined. Caudal rami scarcely as long as the anal segment, and of nearly uniform breadth throughout, outermost seta situated about in the middle of the outer edge. Anterior antennæ, when reflexed, reaching but slightly beyond the anterior division of the body, structure about as in *M. longa*, except that the dentiform projection is wanting in the 10th articulation. Last pair of legs composed of only 3 joints, the last 2 being united.

Male resembling that of *M. longa*, but having the cephalosome more strongly vaulted above. Left anterior antenna (more rarely the right) geniculate.

Last pair of legs of a structure similar to that in *M. longa*, but with the terminal joint on both legs less attenuated distally.

Colour.— Body in both sexes highly pellucid, and almost colourless.

Length of adult female 2.50 mm., of male 2.30 mm.

Remarks.—This form is closely allied to *M. longa*, but is of much inferior size, and moreover easily distinguished by its somewhat less slender form, the shorter caudal rami, and the much more strongly vaulted cephalosome. Finally, the last pair of legs in the female are only 3-articulate, the outer 2 joints being confluent. The form described by Brady in his work on the British Copepoda as *M. armata* is unquestionably the present species. It was subsequently recorded by the same author under another name, viz., *Paracalanus hibernicus*, and Dr. Giesbrecht in his great work records it as *Metridia hibernica*, not being at that time aware of its identity with Boeck's species.

Occurrence.—Whereas *M. longa* must be regarded as a true Arctic form, the present species is evidently of a more southern range. I have found it rather commonly along the south and west coasts of Norway and, unlike what is the case with *M. longa*, it is often met with near the surface of the sea. It extends northwards at least to the Lofoten Islands, and it was also found in some of the plankton-samples taken in the open sea during the cruise of the "Michael Sars". On the other hand, I have never found it in any samples from the Arctic Ocean. The luminous property of this form is mentioned by Boeck, who for this reason proposed for it the specific name *lucens*.

Distribution.—British Isles (Brady), Iceland, Faroe Channel (Norman), Atlantic Ocean between lat. 50° and 62° N. (Cleve).

Gen. 19. **Pleuromamma**, Giesbrecht, 1898.

Syn: *Pleuromma*, Claus (not Doneschall).

Generic Characters.—Form of body generally less slender than in *Metridia*, in some cases rather different in the two sexes. Cephalosome with a very conspicuous dark-coloured mammilliform knob (luminous organ) on right side, at the base of the posterior maxillipeds, rostral prominence generally with 1 or 2 dentiform ledges in front, tentacular appendages shorter than in *Metridia*. Lateral parts of last segment of metasome rounded off. Urosome less slender than in *Metridia*, with the genital segment in female considerably protuberant below; anal segment

somewhat flattened, widening distally, and projecting on each side in a conspicuous angular corner. Caudal rami comparatively smaller than in *Metridia*. Anterior antennæ resembling in structure those in the above-named genus, some of the proximal articulations being produced as more or less conspicuous dentiform projections, generally wanting in male; left antenna in the latter as a rule geniculate, and having the proximal sensory appendages very large, leaf-like. Posterior antennæ with the outer ramus longer than the inner, and distinctly 7-articulate. Anterior lip rather prominent and defined in front by a deep transverse sinus. Oral parts scarcely differing in their structure from those in *Metridia*. Natatory legs, on the other hand, much more strongly built, with the outer ramus of 2nd to 4ht pairs very large and expanded, with comparatively short spines and setæ; that of 3rd pair with a very deep incision at the end of the 1st joint. Inner ramus in these pairs not attaining half the length of the outer, and having only a single seta outside the terminal joint; that of 2nd pair with the 1st joint distinctly hooked inside. Last pair of legs in female 2- or 4-articulate; those in male 5-articulate, with the terminal joint of right leg securiformly dilated, and the penultimate joint of same leg armed inside with a short spiniform process.

Remarks.—This genus was established by Claus, to include the *Diaptomus abdominalis,* Lubbock, and another Mediterranean species *P. gracile,* Cls.; but as the generic name proposed, *Pleuromma,* had been previously appropriated in Zoology, Dr. Giesbrecht has recently changed it to *Pleuromamma*. This change becomes the more necessary, as the organ regarded by Claus as an eye, has turned out to be of a very different nature, being undoubtedly, as first suggested by Dr. Dahl, a special luminous organ. The genus is very nearly related to *Metridia,* though differing not only in the presence of the above-named organ, but also in some other features mentioned in the above diagnosis. We know at present of 6 species of this genus, one of which belongs to the fauna of Norway, and will be described below.

50. Pleuromamma robusta (Dahl).

(Pl. LXXVIII & LXXIX).

Pleuromma robustum, F. Dahl in „Zool. Anzeiger", Vol. 16, p. 105.

Specific Characters.—Female. Body, as compared with the other species, somewhat robust, with the anterior division, seen dorsally, oblong oval in form, greatest width exceeding $^1/_3$ of the length, and occurring a little behind the middle, anterior extremity somewhat contracted and triangularly produced at the tip, posterior only slightly attenuated. Cephalosome not attaining the length of

the metasome, dorsal face considerably vaulted, rostral projection somewhat prominent, and having in front 2 dentiform ledges. Lateral parts of last segment of metasome obtusely rounded. Urosome slightly exceeding half the length of the anterior division, genital segment bulging considerably below. Caudal rami comparatively small, shorter than the anal segment, outermost seta occurring in about the middle of the outer edge. Anterior antennæ, when reflexed, reaching beyond the middle of the 2nd caudal segment, dentiform projections of the proximal joints comparatively small and not recurved. Last pair of legs distinctly 4-articulate, terminal joint lamellarly dilated and oval in form, being finely ciliated on both edges and armed at the tip with 3 setæ, the outer 2 rather short, the innermost very slender and elongated, extending obliquely inwards.

Male much smaller than female and of more slender form, with the urosome perfectly symmetrical and very narrow, 2nd and 3rd segment partly hairy outside. Left anterior antenna distinctly geniculate, and having the sensory appendages of the proximal joints very large. Second pair of legs with the inner ramus of same structure on both sides, and agreeing with that in the female. Last pair of legs very asymmetrical, right leg much the larger and having the terminal joint considerably dilated, securiform, that of left leg much narrower, oblong.

Colour not yet ascertained.

Length of adult female 4.30 mm., of male 3.50 mm.

Remarks.—This species has been briefly mentioned by Dr. F. Dahl in the above-quoted Journal; but no detailed description or figures have as yet been published. I think, however, that I am right in identifying the present form with Dahl's species, as it seems to agree pretty well with it both in size and in some of the anatomical details mentioned by that author.

Occurrence.—Some few specimens of this handsome species were found in a plankton-sample taken during the cruise of the "Michael Sars" in 1900, at Stat. 9, located somewhat North of the Faroe Islands, the depth being recorded to be from 200 to 400 metres. A single female specimen also occurred in another plankton-sample taken during the same cruise in the Storfjord, inland from Aalesund (Stat. 4), its occurrence here evidently proving this form to be a true member of the Norwegian fauna.

Distribution.—Atlantic Ocean in depths from 100 to 1500 meters (Dahl), Faroe Channel, West of Ireland (Norman's collection)[1]).

[1]) Determined by the present author.

Fam. 17. Heterorhabdidæ.

Characters.—Body more or less depressed, and generally highly pellucid Cephalosome well defined from the 1st pedigerous segment, front more or less produced, and carrying below 2 delicate tentacular filaments. Last 2 segments of metasome united. Urosome consisting in female of 3 or 4 segments, in male of 5 segments. Caudal rami of different shape in the different genera, in some cases asymmetrical; setæ present in the normal number. Anterior antennæ very slender, in some cases of quite an extraordinary length, and composed in female of 25 articulations; left antenna in male generally geniculate. Posterior antennæ with the rami more or less unequally developed. Oral parts, especially mandibles and maxillæ, differing conspicuously in their structure from those parts in other Calanoids. Legs with both rami triarticulate; last pair biramous and natatory, like the preceding pairs, outer rami of this pair slightly transformed in male. No ovisac present in female.

Remarks.—The forms belonging to this family, in the restriction here adopted, are chiefly characterised by the pellucid, more or less depressed body, the very slender anterior antennæ, the anomalous structure of some of the oral parts, and finally, by the fact that the last pair of legs are biramous and natatory, like the preceding pairs. In the last-named character, this family agrees with the *Centropagidæ;* but it is otherwise very different. The family comprises at present 3 distinct genera, viz., *Heterorhabdus,* Giesbr., *Haloptilus,* Giesbr. and *Augaptilus,* Giesbr. The first 2 of these genera are represented in the fauna of Norway, and will by treated of below.

Gen. 20. **Heterorhabdus,** Giesbrecht, 1898.

Syn: *Heterochæta,* Claus (not Westwood).

Generic Characters.—Body more or less robust, with the anterior division somewhat vaulted above, and depressed only in its anterior part. Cephalosome comparatively short, with a well-marked cervical depression above in the middle, front slightly projecting in front and carrying below 2 nearly straight tentacular appendages. Lateral parts of last segment of metasome not produced. Urosome of moderate length, and consisting in female of 4 segments, the last of which, however, is imperfectly defined from the caudal rami; the latter scarcely at all

divergent, and conspicuously asymmetrical, the left one being the larger, and having one of the apical setæ excessively prolonged. Eye wholly wanting. Anterior antennæ greatly attenuated and abruptly curved in their proximal part; left one in the male geniculate. Posterior antennæ with the rami of not very different length, the outer one 7-articulate. Mandibles with the cutting teeth much reduced in number, the outermost one widely separated from the others and claw-shaped, with a peculiar rim outside; palp well developed, with the inner ramus shorter than the outer. Maxillæ with the inner ramus of the palp quite rudimentary, outer ramus greatly produced, and tipped with long setæ. Anterior maxillipeds exceedingly powerful, and armed in their distal part with strong, anteriorly-curving claw-like spines, proximal digitiform lobes rudimentary. Posterior maxillipeds scarcely longer than the anterior ones, and much narrower, with the 2nd basal joint very slender, terminal part 5-articulate, and clothed with comparatively short setæ. Legs powerfully developed, outer ramus in 2nd to 4th pairs very large, with the terminal joint considerably expanded, especially in the 3rd pair, and having both the spines and the setæ unusually short. Last pair of legs in female considerably smaller than the preceding ones, outer ramus with a slender falciform spine inside the 2nd joint; those in male somewhat larger, with the outer rami subprehensile and without any natatory setæ.

Remarks.—This genus was established in the year 1863 by Claus, to comprise 2 Mediterranean species. As, however, the generic name, *Heterochæta*, proposed by him had been previously appropriated in Zoology, Dr. Giesbrecht has recently changed it to *Heterorhabdus*. It is a very distinct genus, easily recognizable, among other things, by the peculiar asymmetry of the caudal rami and the excessive length of one of the apical setæ issuing from the left ramus. Dr. Giesbrecht enumerates no less than 13 species belonging to this genus, and a 14th, *H. compactus*, G. O. Sars, has been added by the present author from Nansen's Polar Expedition. Only a single species belongs to the fauna of Norway, and it will be described below.

51. Heterorhabdus norvegicus (Boeck).

(Pl. LXXX & LXXXI).

Heterochæta norvegica, Boeck. Nye Slægter og Arter af Saltvandscopepoder. Chr. Vid. Selsk. Forh. 1872, p. 40.

Specific Characters.—Female. Body moderately slender, with the anterior division, seen dorsally, oval fusiform in outline, greatest width somewhat exceeding $^1/_3$ of the length, and occurring about in the middle, anterior extremity gradually narrowed and obtusely truncated at the tip, with a knob-like projection in the

middle of the front, posterior extremity only slightly contracted; seen laterally, evenly vaulted above Cephalosome about equalling in length the 3 succeeding segments combined, and distinctly depressed in its anterior part, front somewhat abruptly bent anteriorly, tentacular appendages very slender and extending obliquely backwards. Lateral parts of last segment of metasome broadly rounded at the tip. Urosome equalling about half the length of the anterior division, genital segment fully as long as the 2 succeeding ones combined, and rather tumefied in the middle, bulging considerably below, and having a slight dorsal depression behind; posterior edge of this and the 2 succeeding segments finely denticulate above. Anal segment not widening at all distally, and on left side wholly confluent with the corresponding caudal ramus, on right side only faintly defined. Left caudal ramus much larger than right, both slightly attenuated, being cut off very obliquely at the end in such a manner that only 2 of the marginal setæ issue from the tip, the other 3 from the outer edge; outer apical seta of left ramus excessively prolonged, even exceeding the whole body in length, and terminating in a very slender, hair-like point. Anterior antennæ about the length of the body, and having the 1st joint rather large and compressed, equalling in length the 5 succeeding joints combined, distal part very slender and generally extended directly laterally. Anterior maxillipeds with the distal claws very strong, though not nearly attaining the length of the stem. Posterior maxillipeds with a remarkably prolonged, subsigmoid spine issuing from the middle of the 1st basal joint anteriorly. Inner ramus of 3rd pair of legs not attaining even $^1/_3$ of the length of the outer. Last pair of legs with the outer ramus about twice the length of the inner, falciform spine shorter than the terminal joint and extending almost straight inwards.

Male somewhat more slender than female, with the urosome very narrow. Left anterior antenna with the middle section but slightly tumefied, terminal section very slender, and 4-articulate. Last pair of legs somewhat asymmetrical, right leg with a large and abruptly curved, sausage-shaped prominence inside the 2nd basal joint, outer ramus rather strongly built, with the 1st joint remarkably produced at the end outside, 2nd joint oval in form, with an irregular protuberance inside, terminal joint but slightly exceeding in length the 2 preceding ones combined, the apical part being quite short; outer ramus of left leg of about same length as that of the right, terminal joint lamellar and produced at the tip to a slender, somewhat flexuous spine of moderate length.

Colour.—Body highly pellucid, with a faint yellowish tinge, and exhibiting within the anterior division a number of clear globular oil-bubbles.

Length of adult female reaching to 4.20 mm, that of male about the same.

Remarks.—This form was briefly mentioned by Boeck in the above-mentioned paper, and some figures of it were given by the present author in his account of the Crustacea procured during Nansen's Polar Expedition. It is nearly allied to the 2 Mediterranean species, *H. spinifrons* and *H. papillatus*, recorded by Claus; but it is of larger size than either of them, and moreover differs in the relative length of the anterior antennæ, and in the structure of the last pair of legs in the male.

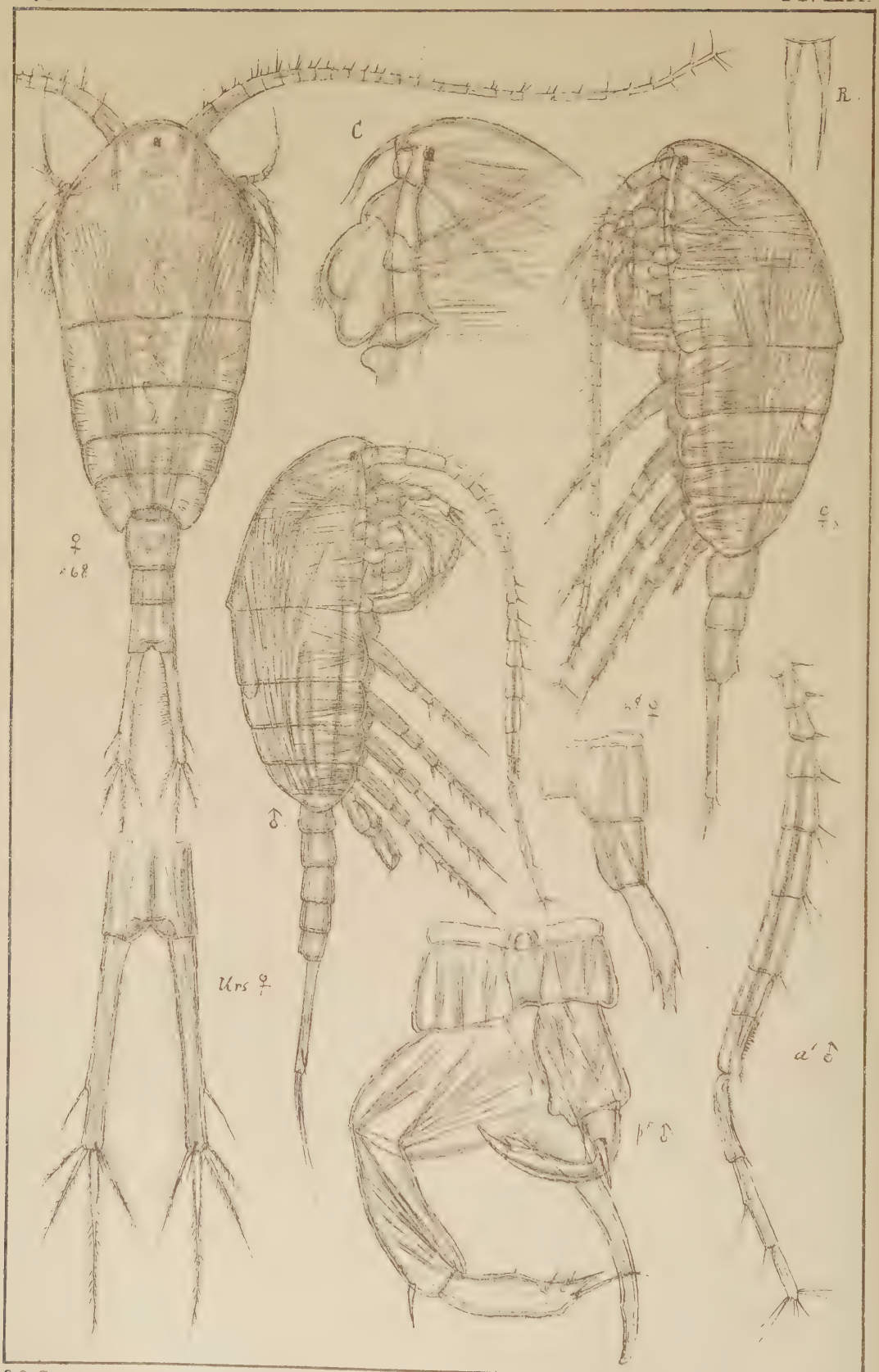
Occurrence.—Boeck first found this form at Haugesund, west coast of Norway. I have myself taken it in several places, from the Christiania Fjord and as far north as the Lofoten Islands, but only in greater depths, of more than 150 fathoms. It also occurred not unfrequently in some plankton-samples taken from deep water in the open sea during the cruise of the "Michael Sars" in 1900.

Distribution.—Polar basin crossed by Nansen, in several places rather abundantly (the present author), Greenland, Faroe Channel (Norman's collection).

Gen. 21. **Haloptilus**, Giesbrecht, 1898.

Syn: *Hemicalanus*, Claus (not Dana).

Generic Characters.—Body subdepressed and highly pellucid. Cephalosome comparatively large; more or less produced in front, and without any distinct cervical depression; rostral filaments slender and recurved. Lateral parts of last segment of metasome not expanded. Urosome comparatively short, composed in female of 4, in male of 5 segments. Caudal rami perfectly symmetrical, not much produced, and somewhat divergent, setæ normally developed, and richly plumous. Eye wholly absent. Anterior antennæ very slender and narrow, with some of the bristles much elongated; left antenna in male geniculate. Posterior antennæ with the inner ramus greatly produced, outer ramus comparatively small. Mandibles with the masticatory part very narrow and bifurcate at the tip, palp slender, with the inner ramus much longer than the outer. Maxillæ with the inner ramus of the palp small, but distinct, outer ramus considerably produced, and carrying at the tip long plumous setæ. Anterior maxillipeds of moderate size, with all the lobes distinctly developed, distal setæ not claw-like. Posterior maxillipeds much larger than the anterior, terminal part 5-articulate and clothed with long, auteriorly-curving setæ. Legs not very powerful, outer ramus of 2nd to 4th pairs of moderate size, with the terminal joint far less expanded than in

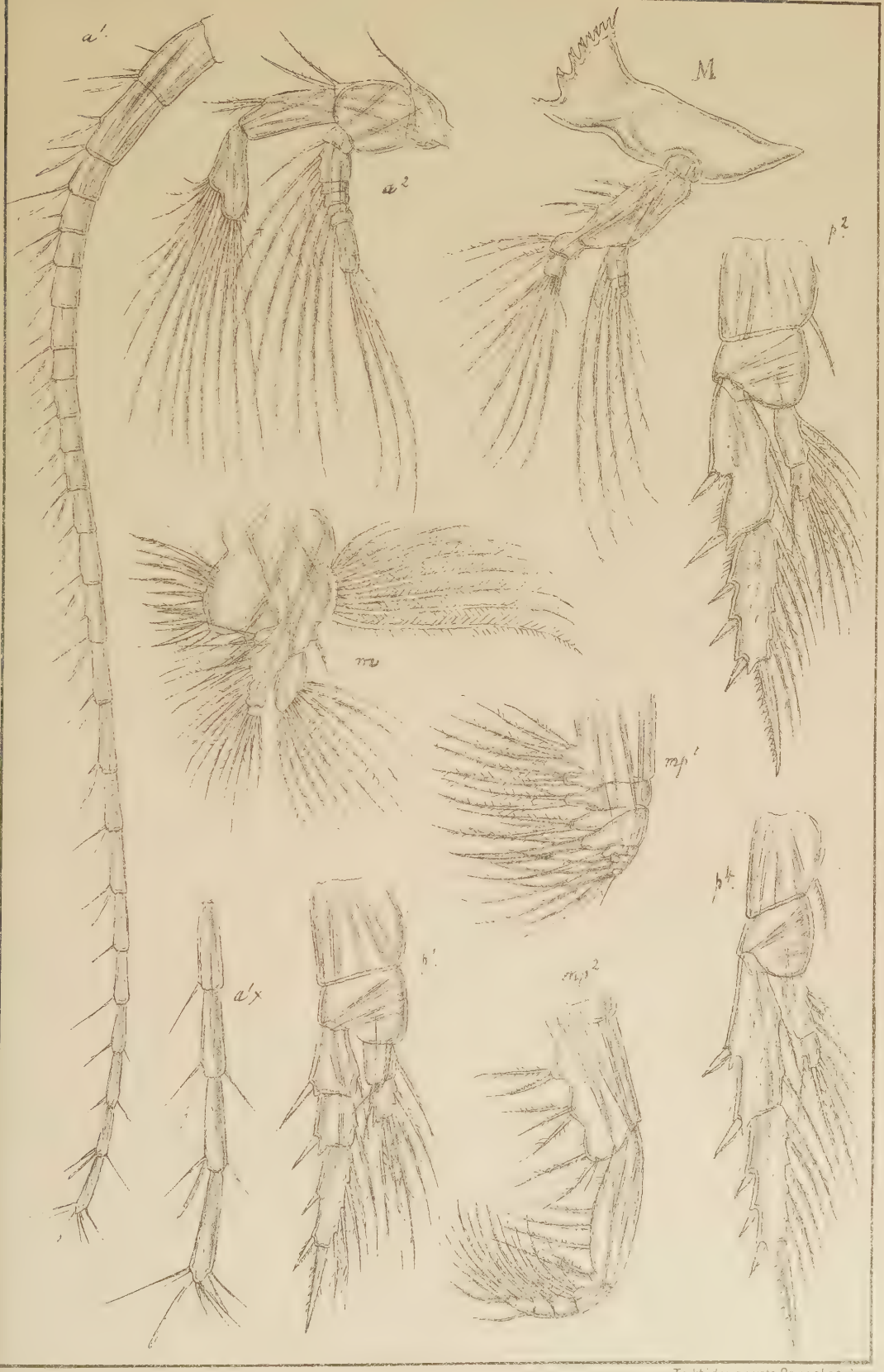


G. O. Sars autogr.

Trykt i den private Opmaaling, Chra.

Temora longicornis (Müll.)

Copepoda
Calanoida.

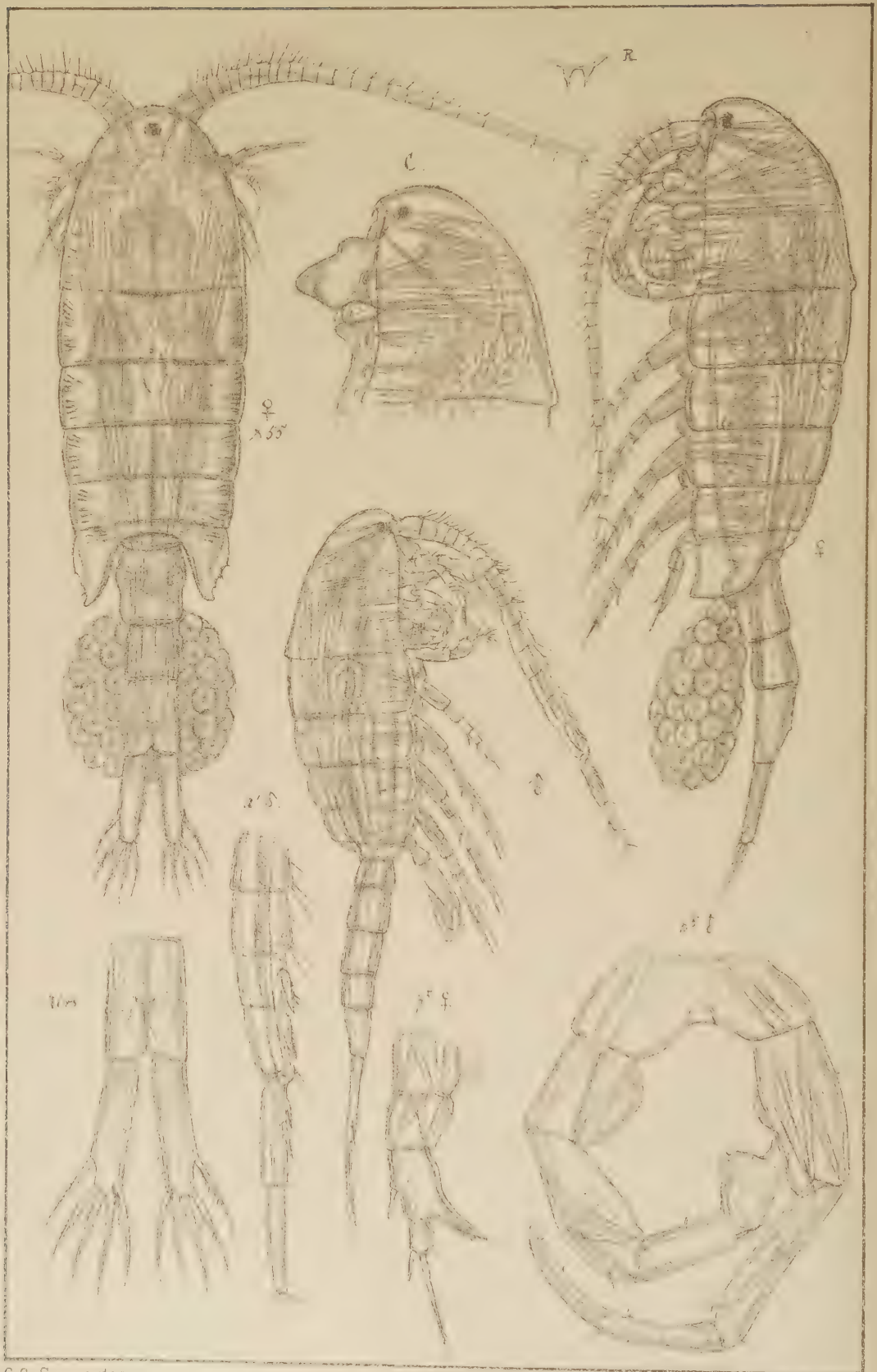


G.O. Sars autogr.

Trykt i den private Opmaaling

Temora longicornis (Müll.)
(continued.)

Copepoda
Calanoida.



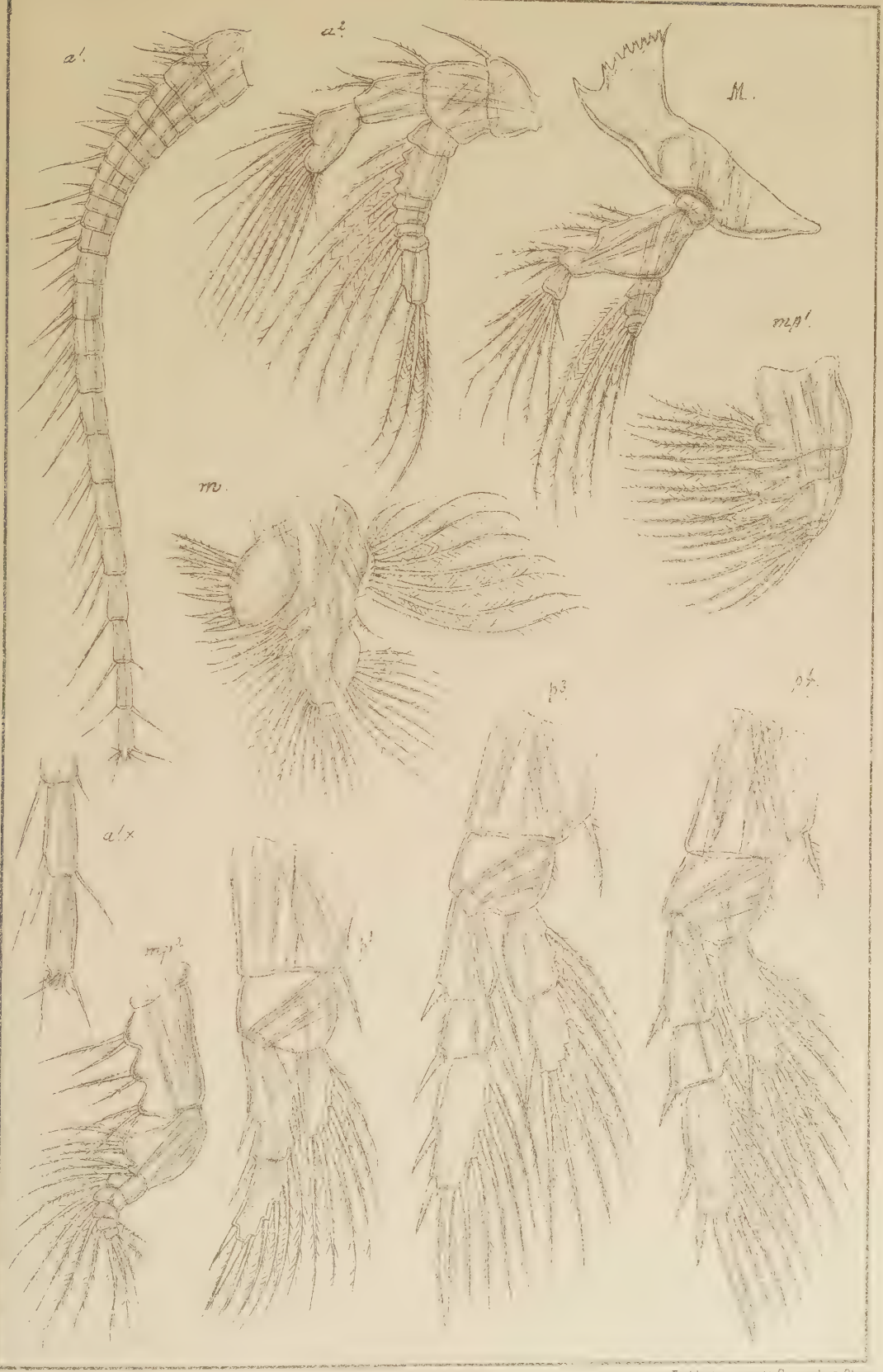
G.O. Sars autogr

Trykt i den private Opmaaling, Chra.

Eurytemora velox (Lilljeborg.)

Copepoda

Calanoida.



G.O. Sars autogr.

Eurytemora velox (Lilljeborg.)
(continued.)

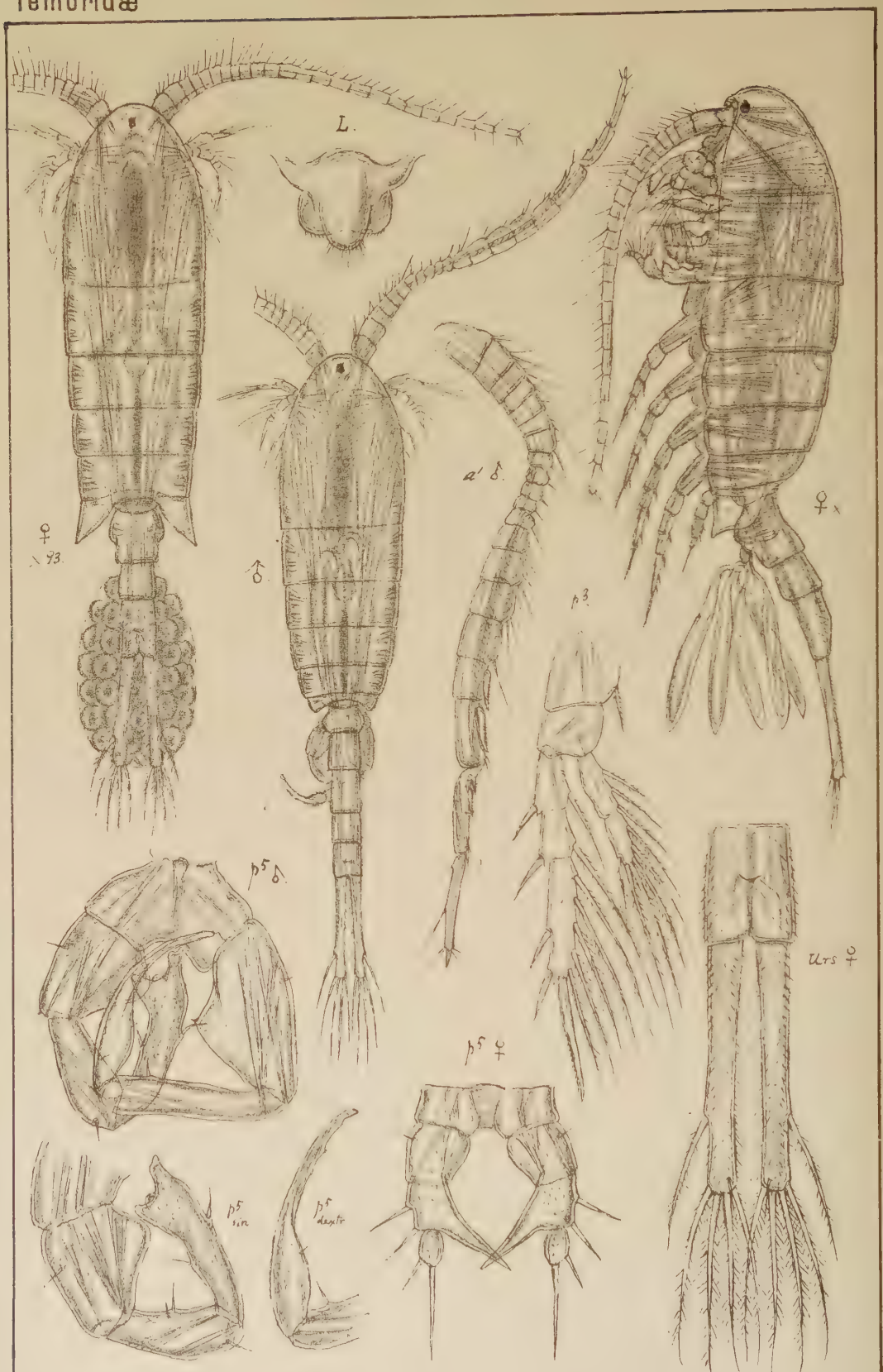
Trykt i den private Opmaaling, Chra

Copepoda

Calanoida.

Temoridæ

PI. LXIX.

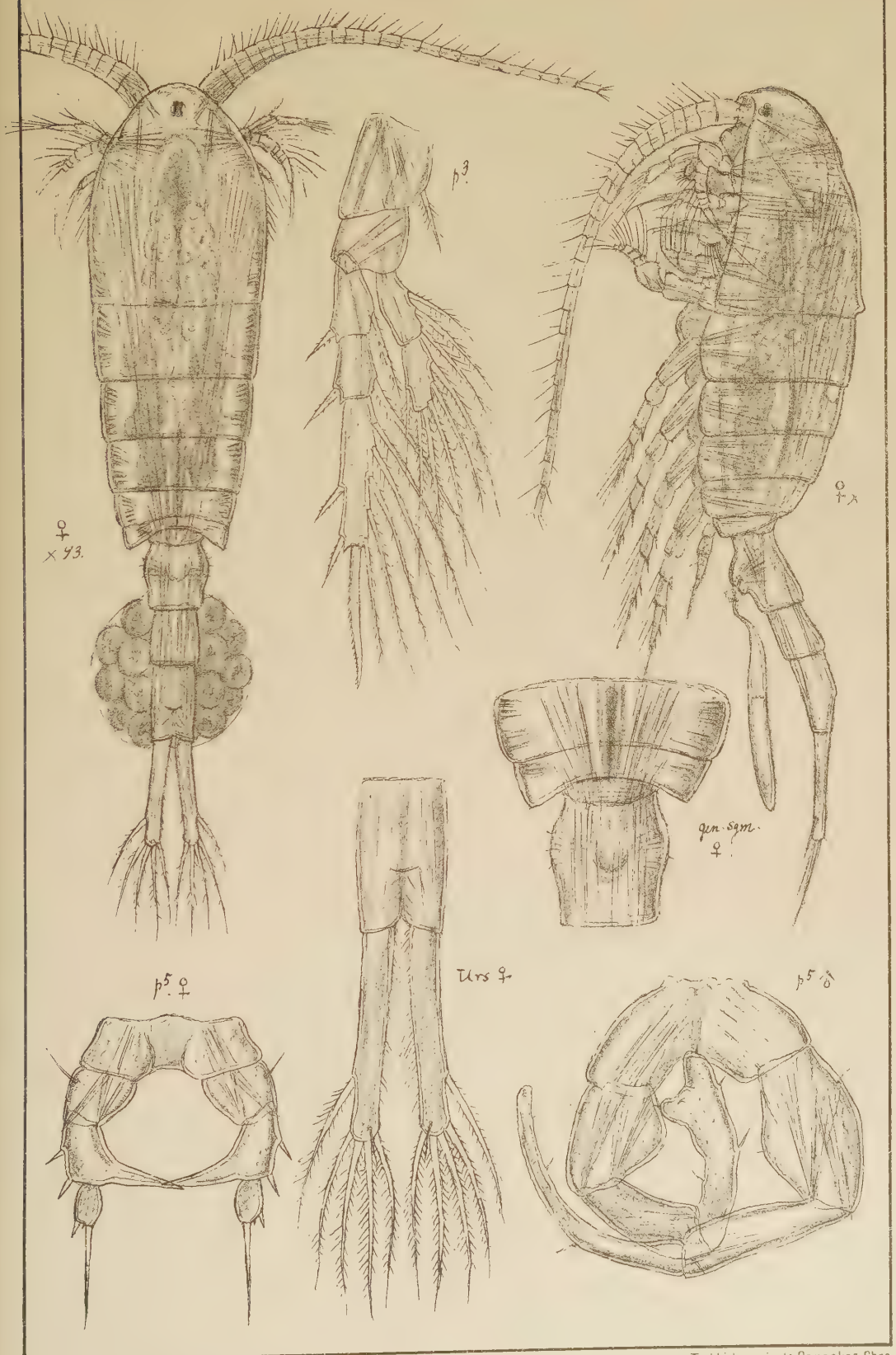


G.O. Sars autogr

Trykt i den private Opmaaling, Chra.

Eurytemora hirundoides, Nordpvist

Copepoda
Calanoida.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

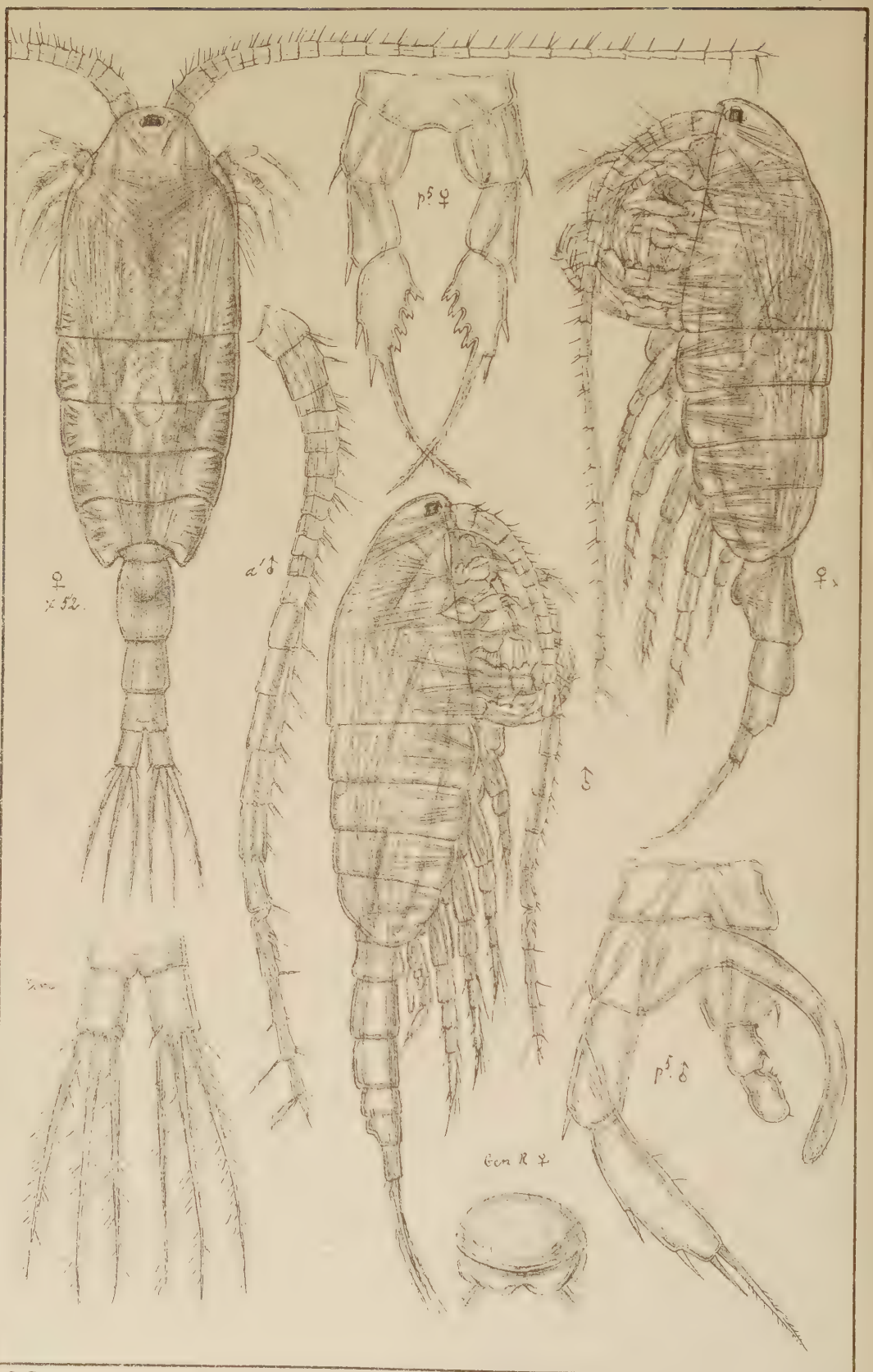
Eurytemora lacustris, Poppe.

Copepoda

Calanoida.

Temoridæ

Pl. LXXI



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

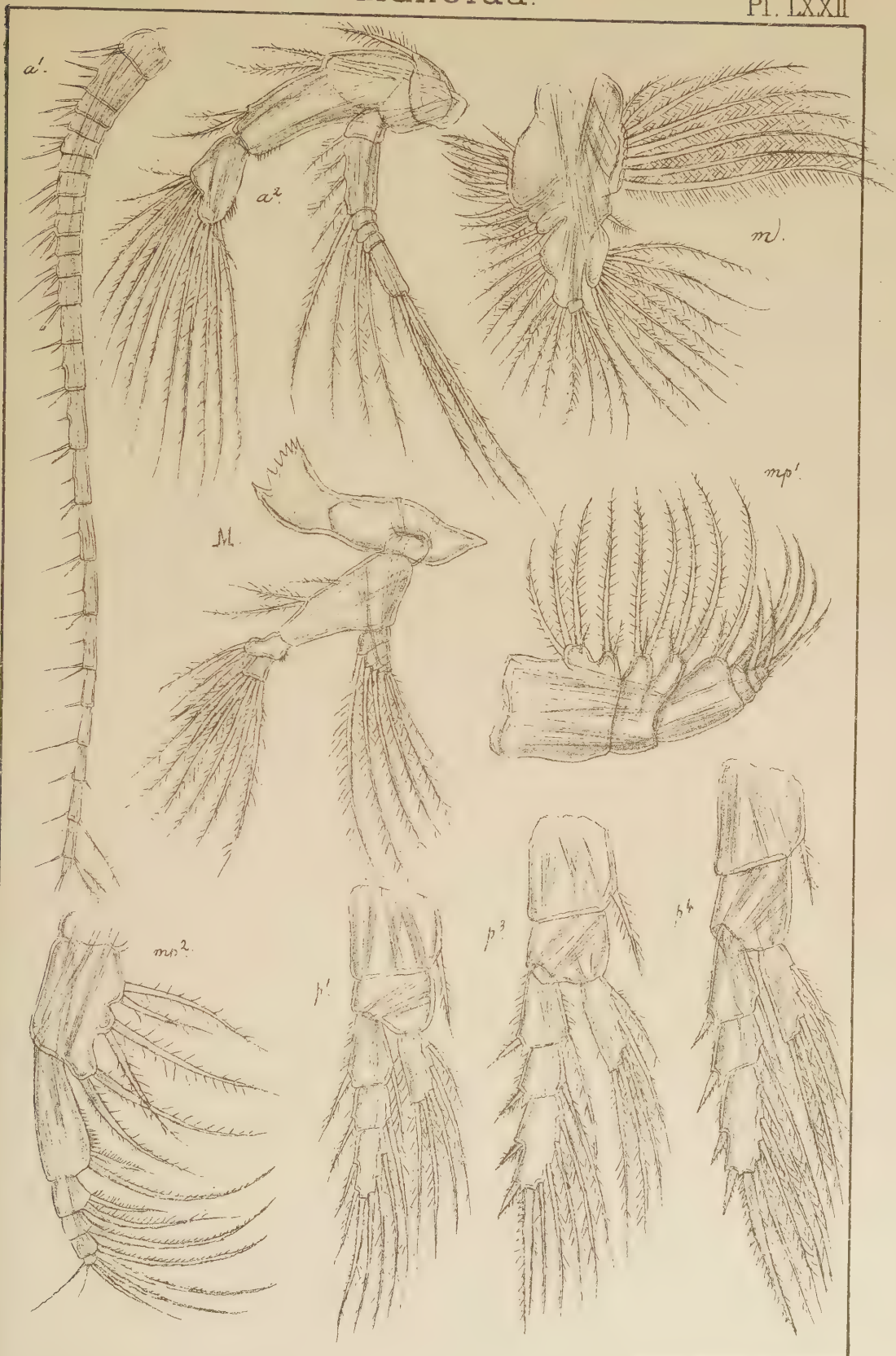
Heterocope saliens (Lilljeb.)

Copepoda

Calanoida.

Temoridæ

PI. LXXII

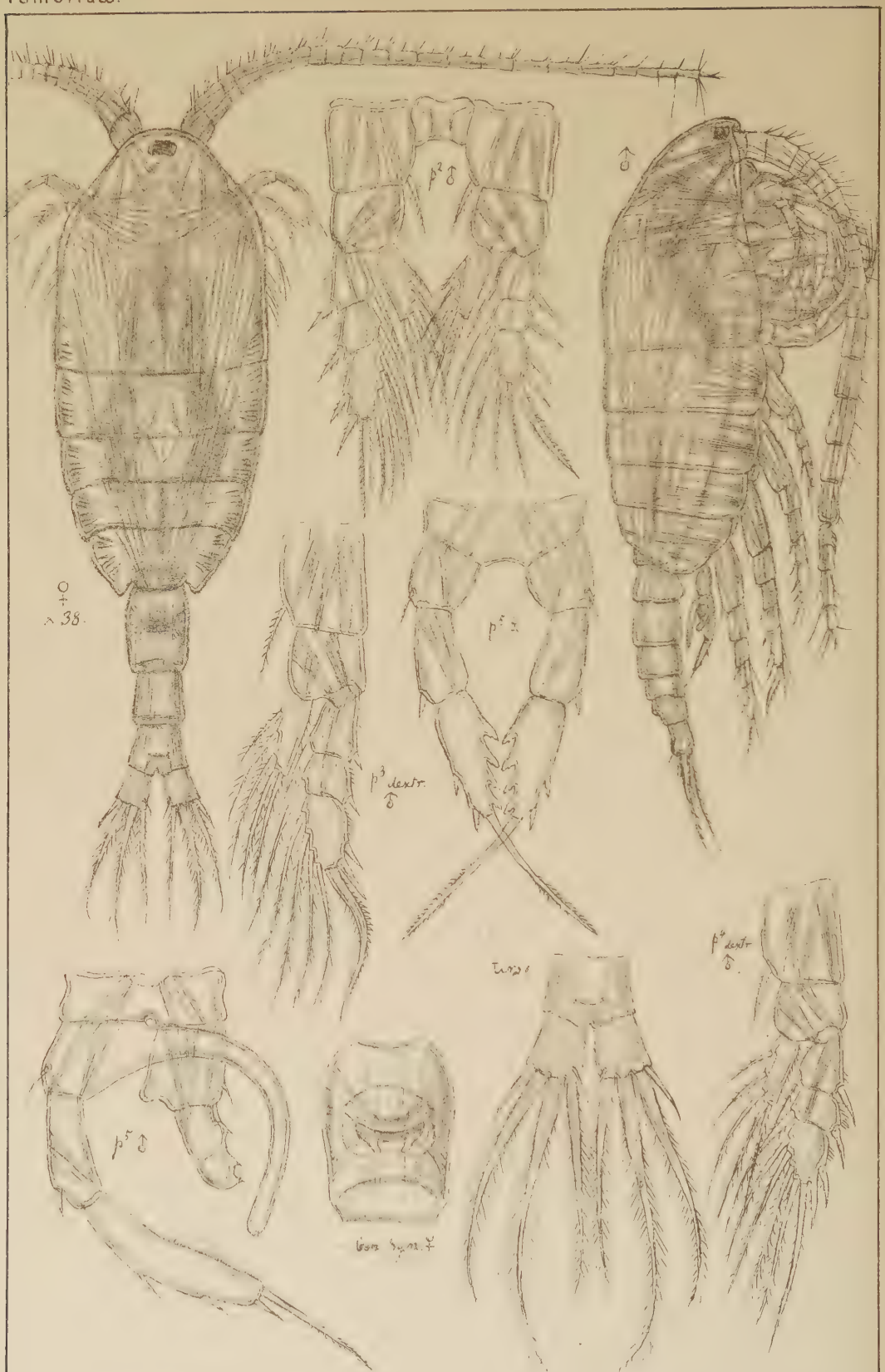


G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Heterocope saliens (Lilljeb.)
(continued.)

Copepoda
Calanoida.

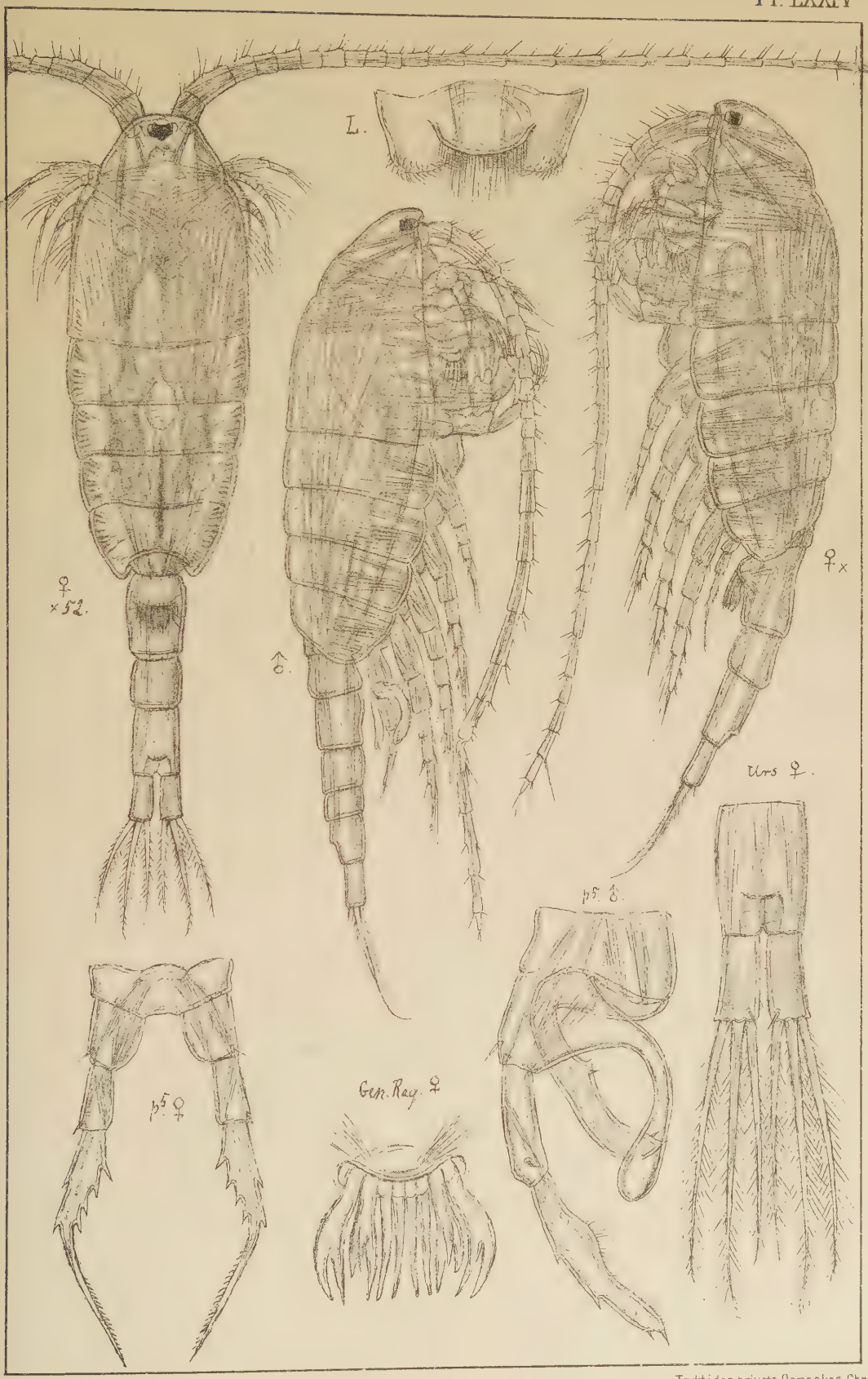


G.O. Sars autogr

Trykt i den private Opmaaling, Chra.

Heterocope borealis (Fischer.)

Copepoda
Calanoida.



G.O. Sars autogr.

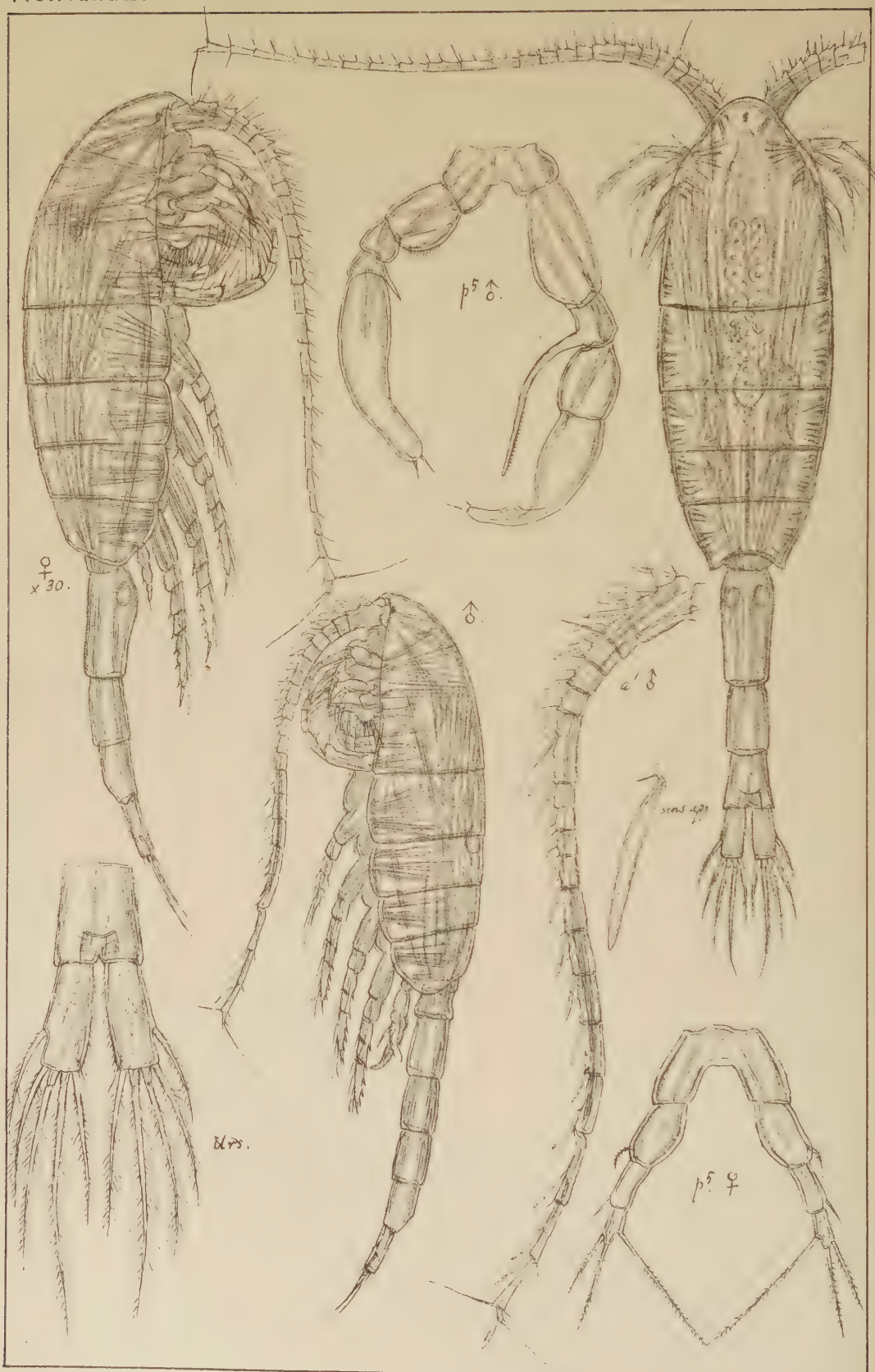
Trykt i den private Opmaaling, Chra

Heterocope appendiculata, G.O. Sars

Copepoda

Calanoida.

Metridiidæ. Pl. LXXV

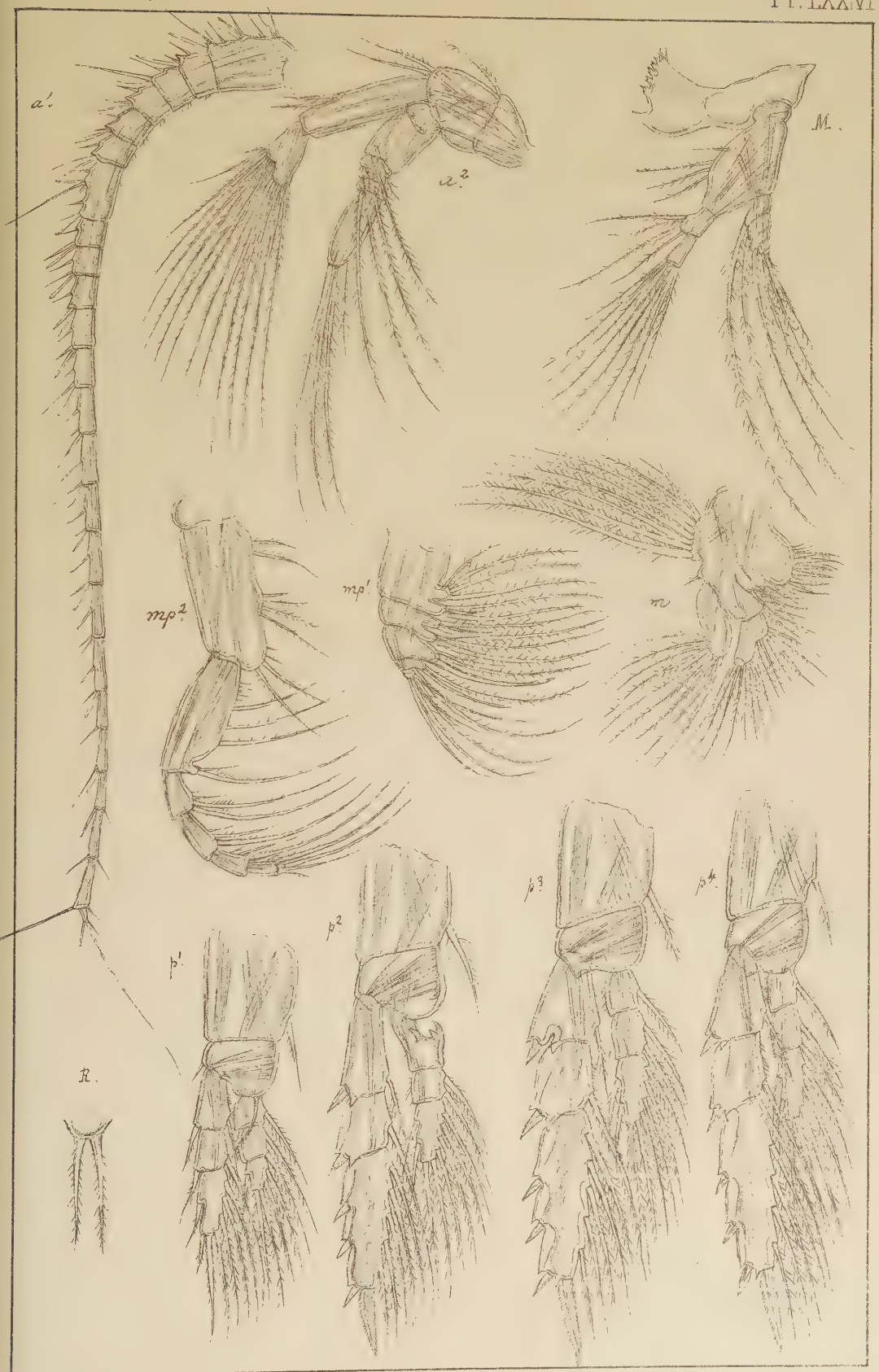


G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Metridia longa (Lubbock.)

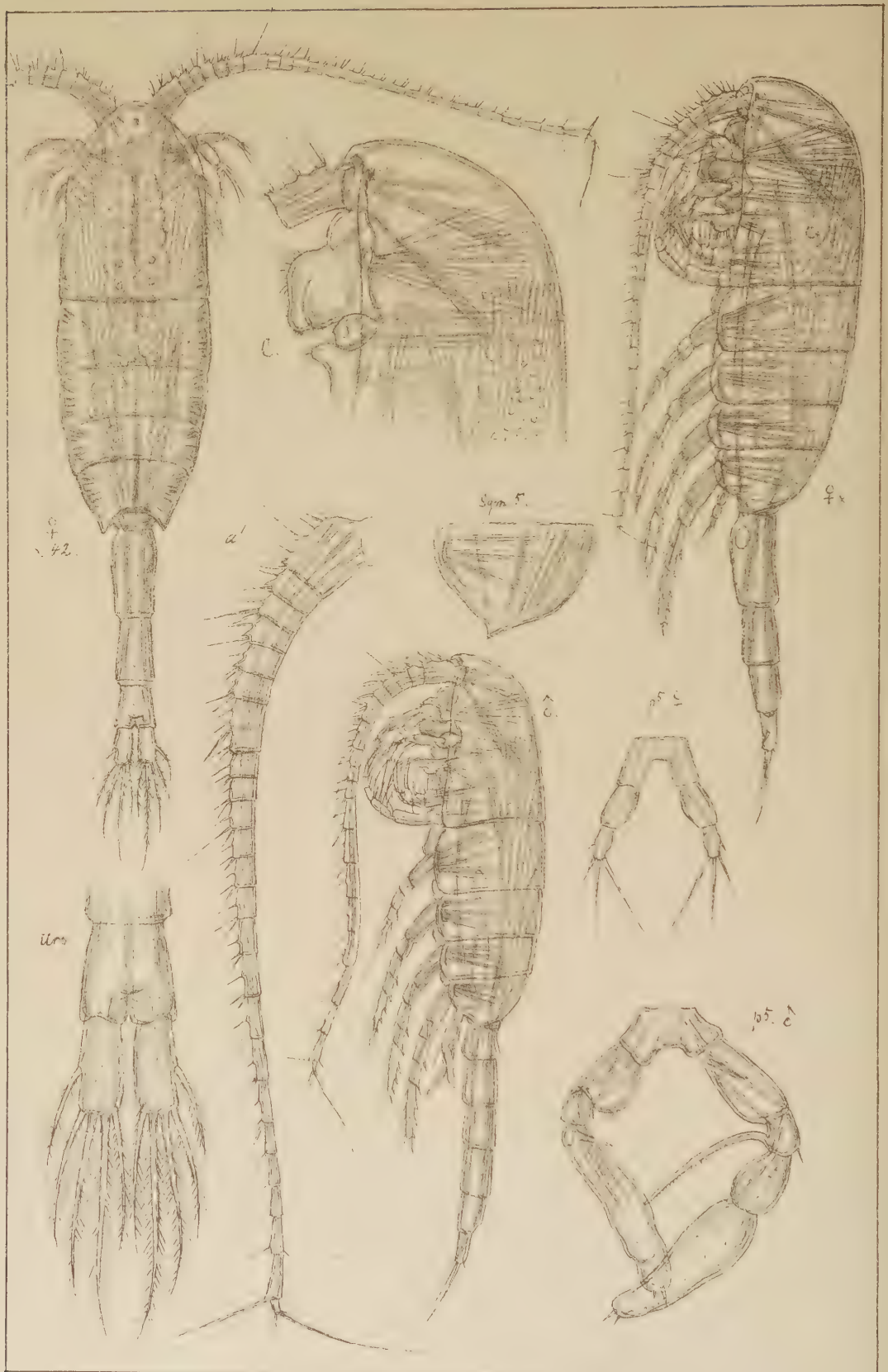
Copepoda
Calanoida.



G.O. Sars autogr.

Metridia longa (Lubbock.)
(continued.)

Trykt i den private Bpmaal



G.O. Sars autogr.

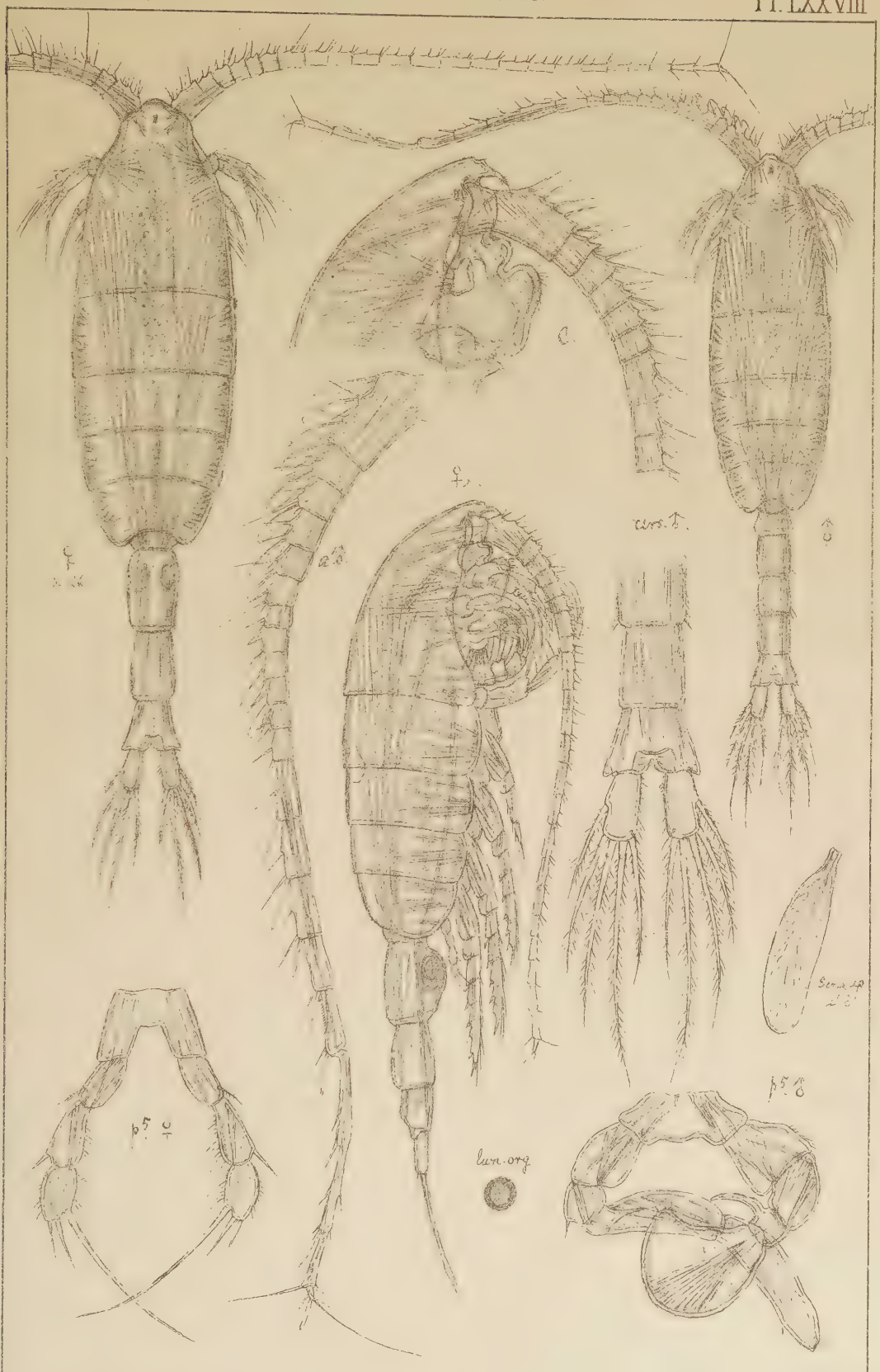
Trykt i den private Opmaaling, Chra.

Metridia lucens, Boek.

Copepoda

Calanoida.

Metridiidæ. PI. LXXVIII



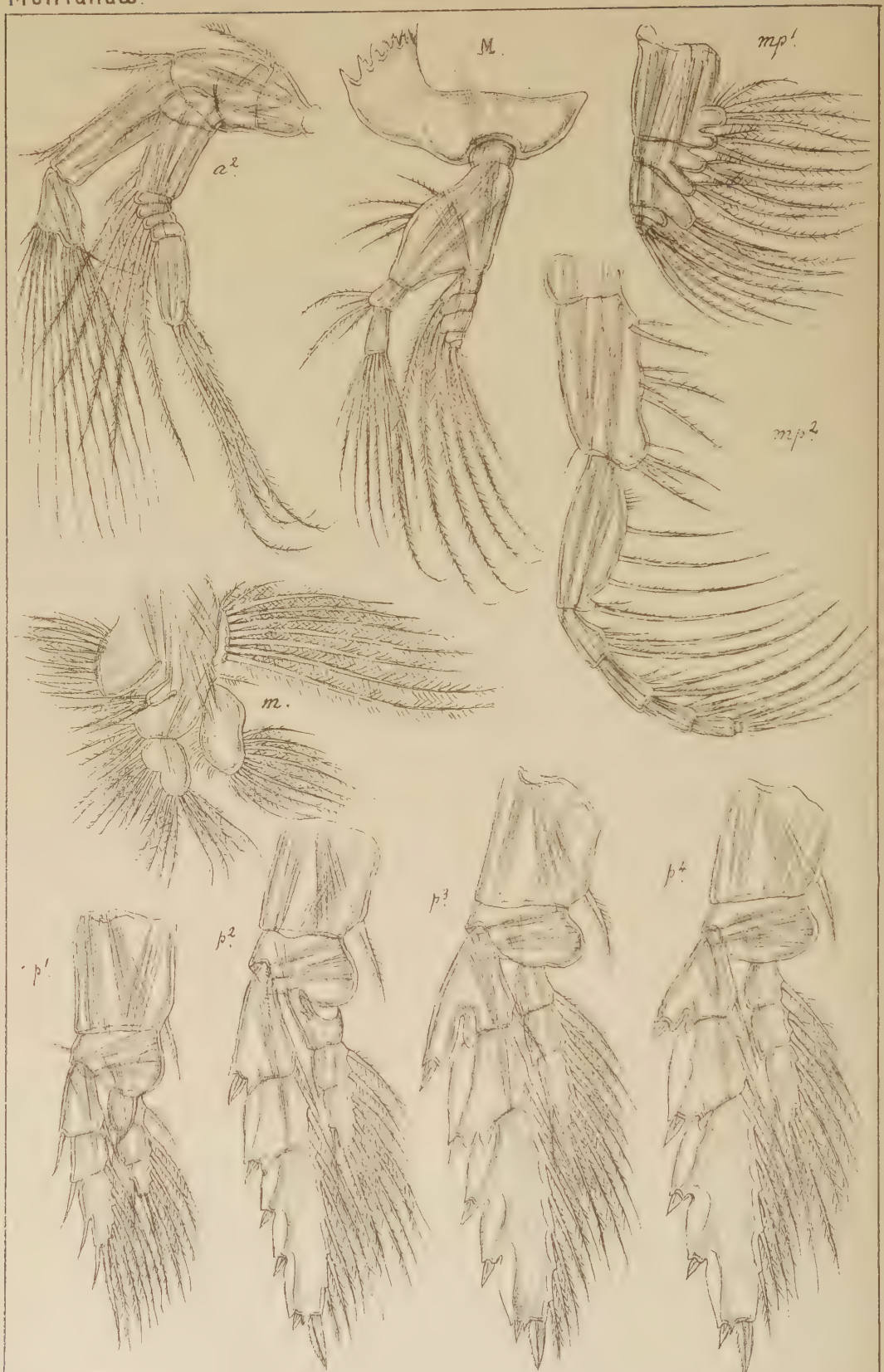
G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Pleuromamma robusta (Dahl)

Copepoda

Calanoida.



G.O. Sars autogr.

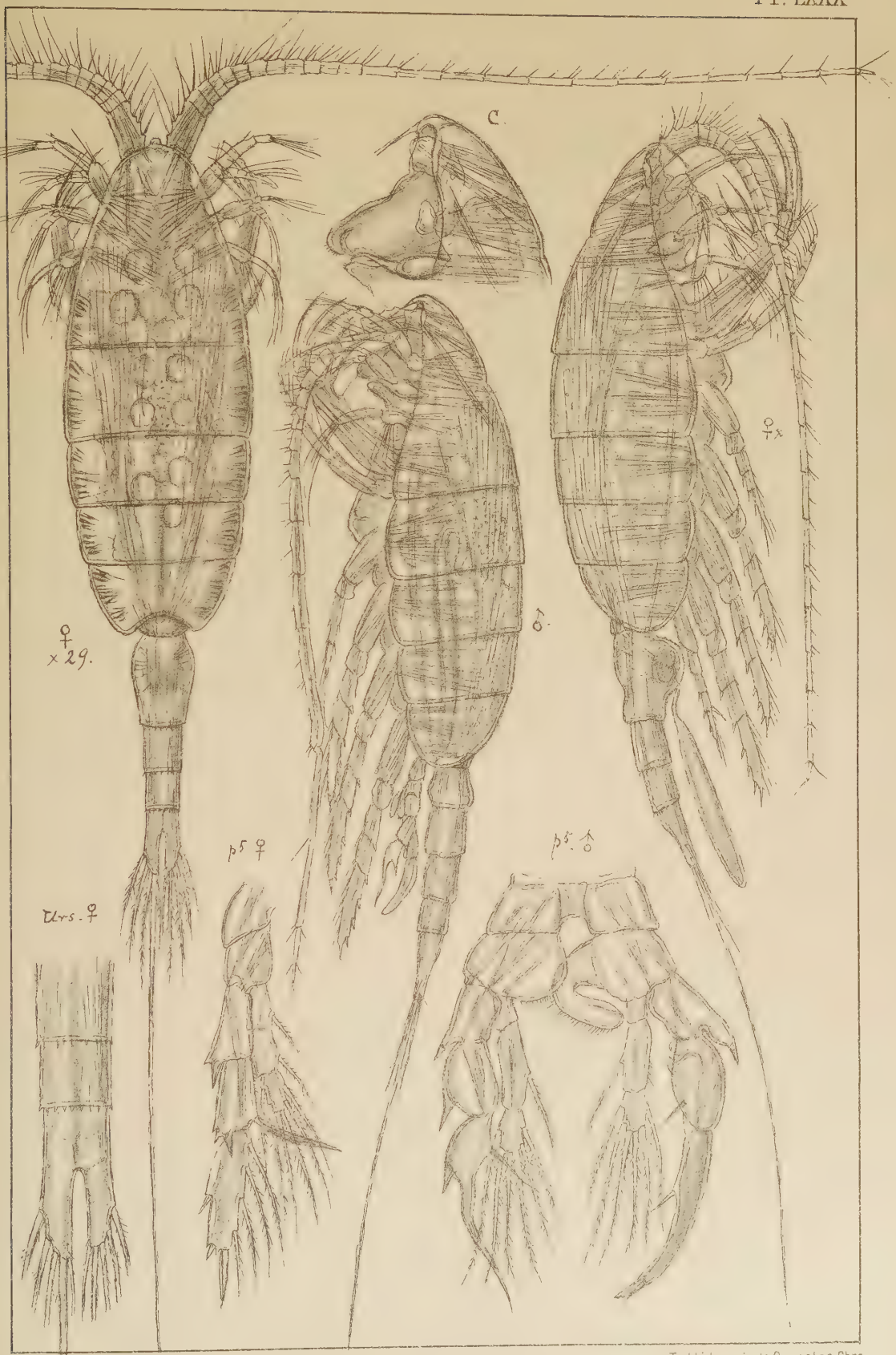
Pleuromamma robusta (Dahl)
(continued.)

Trykt i den private Opmaaling, Chra.

Copepoda

Calanoida.

Heterorhabdidæ. PI. LXXX



G.O. Sars autogr. Trykt i den private Opmaaling, Chra

Heterorhabdus norvegicus (Boeck)

Heterorhabdus, apical spine slender, setiform. Last pair of legs in female resembling in structure the preceding pairs, but of inferior size, 2nd joint of outer ramus without any falciform spine inside; those in male with the outer rami imperfectly prehensile.

Remarks.—This genus was established by Claus in the year 1863, to comprise some Mediterranean Calanoids distinguished by the extraordinary pellucidity of the body, and the richly plumose setæ with which some of the appendages were ornamented. The generic name proposed, *Hemicalanus*, had however previously been used by Dana in a different sense, and for this reason it has recently been replaced by Dr. Giesbrecht with that of *Haloptilus*. Two of the species described by Claus as belonging to this genus have moreover been transferred by the same author to another nearly-related genus, *Augaptilus*, Giesbr. In the restriction now generally adopted, the present genus is easily recognized by the perfectly hyaline, sub-depressed body, the comparatively short urosome, the exceedingly slender anterior antennæ, and the greatly produced inner ramus of the posterior ones. Moreover the structure of the oral parts is rather characteristic. We know at present of 11 or 12 species belonging to this genus. They are, on the whole, southern in distribution, 6 of the species occurring in the Mediterranean, the others in the Pacific and the tropical part of the Atlantic Ocean. Two of the species, however, have been stated to occur occasionally in the Norwegian Sea, one of them even as far north as in the Polar basin crossed by Nansen. These 2 species, which can thus only be regarded as quite exceptional visitors in the northern ocean, will be described below.

52. Haloptilus longicornis (Claus).

(Pl. LXXXII & LXXXIII, fig. 1).

Hemicalanus longicornis, Claus. Die freilebenden Copepoden, p. 179, Pl. XXIX, fig. 1.

Specific Characters.—Female. Body rather slender and distinctly depressed, with the anterior division, seen dorsally, oblong fusiform in outline, greatest width scarcely exceeding $^1/_3$ of the length, and occurring about in the middle, anterior extremity somewhat contracted, though slightly widening at the insertion of the anterior antennæ, and projecting in the middle to a knob-like prominence, posterior extremity considerably narrowed. Cephalosome about the length of the metasome and genital segment taken together, rostral prominence obtuse, and occurring not far from the frontal edge; tentacular filaments very delicate. Last segment of metasome with the lateral parts not at all expanded. Urosome scarcely exceeding

1/5 of the length of the anterior division, genital segment somewhat dilated in its anterior part, and about the length of the 3 succeeding segments combined. Caudal rami of moderate size and slightly divergent, setæ not very different in length, and densely plumose, the outermost one issuing from a separate ledge of the outer edge, the others from the transversely truncated tip. Anterior antennæ of quite extraordinary length, being more than twice as long as the whole body, and very slender, with some of the bristles greatly elongated and extending in different directions. Posterior antennæ with the inner ramus greatly produced and very slender, outer ramus scarcely more than 1/3 as long, and composed of 7 articulations. Legs of 2nd to 4th pairs with the inner ramus scarcely half as long as the outer, terminal joint of the latter about as long as the other 2 combined, and somewhat narrowed distally. Last pair of legs with a slender seta issuing from the outer corner of the 2nd basal joint.

Colour. Body highly pellucid, and almost perfectly hyaline. Length of adult female 2.15 mm.

Remarks.—This form, first described by Claus from the Mediterranean, is easily recognizable from the other species of this genus by the excessively elongated anterior antennæ, and by the slight, knob-like projection of the front. It is also rather inferior in size to most of the other species.

Occurrence.—A solitary, but well-preserved female specimen of this form was found in a plankton-sample taken during the cruise of the "Michael Sars" in 1901, at Stat. 25 a, located between Finmark and Bear Island.

Distribution.—Mediterranean (Claus), Atlantic and Pacific Oceans between 26° N. and 40° S. Lat. (Giesbrecht), gulf of Guinea (Scott).

53. Haloptilus acutifrons, Giesbr.

(Pl. LXXXIII, fig. 2).

Hemicalanus acutifrons, Giesbrecht, Pelagische Copepoden. Fauna d. golf. Neapel, p. 384, Pl. 3, fig. 11, Pl. 27, fig. 12, Pl. 42, figs. 12, 20.

Syn: *Hemicalanus spinifrons*, G. O. Sars.

Specific Characters.—Female. Anterior division of body, seen dorsally, narrow oblong in form, greatest width only slightly exceeding 1/4 of the length, and occurring somewhat in front of the middle, anterior extremity produced to a long spiniform projection pointing straight anteriorly, posterior gradually narrowed. Cephalosome occupying more than half the length of the body, rostral prominence very slight and somewhat remote from the frontal edge, tentacular filaments rather slender. Urosome very short and somewhat thicker than in *H. longicornis*, other-

wise of a very similar structure. Anterior antennæ shorter than in that species, reaching, when reflexed, beyond the caudal rami by about the 5 outer joints. Posterior antennæ with the inner ramus about twice the length of the outer. Oral parts and legs nearly as in the preceding species.

Colour. Body perfectly hyaline.

Length of adult female 3.20 mm.

Remarks.—I am now of opinion that the specimen described from Nansen's Polar Expedition as *Hemicalanus spinifrons* is more properly referable to the above-named Mediterranean species, with which it seems to agree fairly well, except in its size, which is somewhat larger. Another specimen, exactly agreeing with that found in the Polar Sea, has subsequently been captured farther south, in the Norwegian Sea, for which reason the species is now included in the Fauna of Norway. It may be at once distinguished from *H. longicornis* by the spiniform projection of the front, and the far less elongated anterior antennæ.

Occurrence.—The above-described specimen was found in a plankton-sample taken during the cruise of the "Michael Sars" in 1900 at Stat. 34, located between Jan Mayen and the Norwegian coast, the depth being recorded to be from 500 to 1000 metres.

Distribution.—Mediterranean (Giesbrecht).

Fam. 18. Arietellidæ.

Characters.—Body comparatively robust, not depressed. Cephalosome, as a rule, well defined from the 1st pedigerous segment, front more or less produced below and carrying 2 tentacular appendages. Last 2 segments of metasome united. Urosome comparatively short, composed in female of 4, in male of 5 segments. Caudal rami well defined, short, with some of the apical setæ much elongated. Anterior antennæ less slender than in the *Heterorhabdidæ,* in some cases very short, number of articulations considerably reduced, left antenna, as a rule, longer than the right, and in male imperfectly geniculate, with the terminal part very short, biarticulate. Posterior antennæ with the inner ramus longer than the outer, and having a limited number of setæ at the tip. Oral parts somewhat resembling in structure those in the *Heterorhabdidæ;* mandibular palp, however, without any trace of an inner ramus, and posterior maxil-

lipeds more robust, with the terminal part reflexed. The 4 anterior pairs of legs comparatively short and compact, with both rami triarticulate and less unequal than in the *Heterorhabdidæ*. Last pair of legs not natatory in either of the sexes, inner ramus rudimentary or quite wanting.

Remarks.—The type of this new family is the genus *Arietellus* of Giesbrecht, which was referred by that author to his subfamily *Heterochætinæ*, though in some respects, and more especially in the structure of the last pair of legs, it differs very materially from the 3 genera now included in the family *Heterorhabdidæ*. On the other hand, it exhibits a close relationship to the genus *Paramisophria* of Scott, as also to another new genus, *Scottula*, to be described below, these 3 genera accordingly forming together a natural group or family. The chief distinctive character of this family, as compared with the *Heterorhabdidæ*, is the very different structure of the last pair of legs, these in the latter family being natatory like the preceding ones, whereas in the present family they are much reduced in size, and not at all natatory in either of the sexes. This is apparently a character of fundamental importance, and has for this reason been taken into consideration in the distinction of several other Calanoid families. Another peculiar feature characteristic of the present family, is the inequality of the anterior antennæ in both sexes, the left one being the longer. This inequality is especially conspicuous in the genus *Scottula*, and is also present, though in a less conspicuous manner, in the genus *Paramisophria*. In the typical genus *Arietellus*, it is true, no mention of such an inequality has been made; but, taking into consideration the near relationship of this genus to *Paramisophria*, it seems to me very probable that this character has been overlooked, as it actually was previously in the case of *Paramisophria*. Of the 3 genera at present comprised within the family *Arietellidæ*, 2 are represented in the fauna of Norway, and will be treated of below.

Gen. 22. **Scottula**, G. O. Sars, n.

Generic Characters.—Body quite calanoid in appearance, with the anterior division moderately tumefied; front considerably produced below, and carrying 2 straight tentacular appendages. Last segment of metasome simple, without any subdorsal projections. Urosome moderately slender, with the genital segment in female comparatively short. Caudal rami with 3 of the setæ much elongated,

outermost seta quite rudimentary. Eye wholly absent. Anterior antennæ of moderate length, and very unequal in both sexes, the left one being much the longer; both antennæ in male with long, band-like sensory appendages on the proximal part. Posterior antennæ with the inner ramus very slender, outer 6-articulate, with the terminal joint comparatively short. Mandibles very strong, with only 4 cutting teeth, the outermost claw-like, palp with the ramus shorter than the basal part. Maxillæ with the masticatory lobe poorly developed and armed with only 2 spines, inner ramus of palp altogether wanting, outer large, sub-sigmoid, with 3 long curved setæ at the tip. Both pairs of maxillipeds powerfully developed, the anterior ones with the last joint of the basal part dilated in the middle, and carrying anteriorly a comparatively short but strong spine, appendages of the terminal part slender, claw-like. Posterior maxillipeds with the terminal part 5-articulate, and armed with strong claw-like spines finely denticulated on both edges. Natatory legs moderately strong, basal part not produced at the end inside, 2nd joint of inner ramus normal. Last pair of legs in female rather small, 3-articulate, 2nd joint not produced inside, terminal joint of moderate size and tipped with an ordinary seta; those in male 5-articulate and but slightly asymmetrical, terminal joint on both legs transformed to a slender claw.

Remarks.—This new genus is undoubtedly nearly allied to *Arietellus* of Giesbrecht, differing, however, not only in the very conspicuous inequality of the anterior antennæ, but also in the structure of the last pair of legs and that of the caudal rami. I have much pleasure in naming this genus in honour of the distinguished Scottish naturalist, Th. Scott, who has done so much important work in this order. A genus of Ostracoda, *Scottia*, has already, as is well known, been established by Canon Norman, likewise in honour of this naturalist. The present genus comprises as yet only a single species, to be described below.

54. Scottula inæqvicornis, G. O. Sars, n. sp.

(Pl. LXXXIV & LXXXV).

Specific Characters.—Female. Anterior division of body but slightly vaulted above, seen dorsally, regularly elliptical in form, greatest width equalling about half the length and occurring in the middle, both extremities gradually tapered, the anterior one narrowly rounded, the posterior deeply emarginated in the middle. Cephalosome well defined from the 1st pedigerous segment, rostral prominence rather large, conical, and pointing straight downwards, tentacular appendages slender and elongated. Lateral lobes of last segment of metasome

somewhat produced and narrowly rounded at the tip. Urosome exceeding in length $^1/_3$ of the anterior division, genital segment scarcely protuberant below. Caudal rami scarcely twice as long as they are broad, and not at all divergent, outermost seta present only as a minute hair, outermost but one only slightly longer than the caudal rami, the other 3 very much elongated. Left anterior antenna about the length of the anterior division of the body, and composed of 20 articulations, 7th to 10th very small; right antenna much shorter, scarcely reaching, when reflexed, beyond the 1st pedigerous segment, and composed of 19 articulations only, bristles on both antennæ partly ciliated. Posterior antennæ with the distal joint of the inner ramus shorter than the proximal one. Last pair of legs with the 2nd joint provided at the end inside with a long seta, terminal joint about the length of the other 2 combined, and armed outside with 2 short spines.

Male resembling the female in shape, but of considerably smaller size, and, as usual, having the urosome narrower and 5-articulate. Anterior antennæ exhibiting a similar inequality in length to that in the female, both provided on the proximal part with long band-like sensory appendages curved backwards, left one with an imperfect hinge near the tip, middle section scarcely at all tumefied. Right last leg a little longer than left, but otherwise of a very similar structure.

Colour. Body rather pellucid, with a light yellowish grey tinge.

Length of adult female 1.10 mm., of male 0.86 mm.

Remarks.—As mentioned above, this is as yet the only known species of the present genus. It is easily recognizable from all our other Calanoids by the very conspicuous inequality of the anterior antennæ. Its appearance is otherwise quite calanoid.

Occurrence.—Some few specimens of this peculiar Calanoid, all of the female sex, were found many years ago by the present author in the upper part of the Christiania Fjord, not far from the town, the depth being about 30 fathoms. A solitary male specimen, the one figured here, was further captured last summer in another locality of the Norwegian coast, viz., in the Storfjord, inland from Aalesund, at a depth of about 60 fathoms. It is a true bottom-form, always keeping close to the ground, and accordingly can only be procured by the aid of the dredge. This circumstance, in addition to its small size and insignificant colouring, may be the cause of its having escaped the attention of other authors, even that of the sharp-sighted Scottish naturalist, Th. Scott.

Gen. 23. **Paramisophria,** Scott, 1897.

Generic Characters.—Body cyclopoid in appearance, with the anterior division considerably tumefied. Cephalosome only faintly defined from the 1st pedigerous segment, front produced below to a very small rostral prominence, carrying on the tip 2 extremely minute filaments. Last segment of metasome with 2 very conspicuous subdorsal projections. Urosome somewhat robust, with the genital segment in female comparatively short. Caudal rami rather broad, with all the setæ well developed, 2 of them considerably longer than the others. Eye inconspicuous. Anterior antennæ very short and less unequal than in *Scottula,* both consisting in female of 21 articulations; left antenna in male with a slight hinge near the tip. Posterior antennæ and oral parts resembling in structure those in *Scottula;* maxillæ, however, with the masticatory lobe more fully developed, and with a distinct, though small inner ramus on the palp. Maxillipeds less robust. Natatory legs powerfully developed, with the rami considerably broader than in *Scottula,* basal part in 2nd to 4th pairs produced at the end inside to an acute triangular projection, 2nd joint of inner ramus considerably expanded outside. Last pair of legs of larger size than in *Scottula,* being in female 3-articulate, with the 2nd joint produced inside to a narrow lobe, terminal joint of considerable size and coarsely spinous outside; those in male 5-articulate, without any lobe inside the 2nd joint, terminal joint in right leg unguiform, in left spatulate.

Remarks.—This genus was established by Th. Scott in the year 1897, to include a peculiar deep-water Calanoid found by him off the Scottish coast. The name *Paramisophria* is somewhat inappropriate, as this genus in reality does not exhibit any very close relationship to *Misophria,* which even, as shown by Dr. Giesbrecht, belongs to quite a different division of the Copepoda, viz., the *Cyclopoida.* It cannot of course be placed in the family *Misophriidæ,* as first suggested by Th. Scott, whereas it is unquestionably closely related to the genus *Arietellus* of Giesbrecht, and accordingly ought to be included in the family *Arietellidæ,* as here defined. It differs conspicuously from *Scottula,* to which it bears a close relationship in some of the anatomical details, in the general appearance of the body, the much shorter and less unequal anterior antennæ, the full number of caudal setæ, and the larger size of the last pair of legs. The genus comprises as yet only a single species, to be described below.

55. Paramisophria Cluthæ, Scott.

(Pl. LXXXVI & LXXXVII).

Paramisophria Cluthæ, Scott. The Marine Fishes and Invertebrates of Loch Fyne; 15th Annual Report of the Fisheries Board for Scotland, p. 147, Pl. II, figs. 3—8, Pl. III, figs. 13—16.

Specific Characters.—Female. Body rather short and compact, with the anterior division, seen dorsally, oval in form, greatest width equalling about half the length, and occurring somewhat behind the middle, anterior extremity gradually narrowed and obtusely rounded at the tip, posterior only slightly contracted. Cephalosome considerably vaulted, with the dorsal margin forming quite an even curve as far as the tip of the very small rostral prominence. Last segment of metasome with the subdorsal processes spiniform and pointing straight backwards, lateral lobes broadly rounded, with a small indentation in the middle. Urosome scarcely exceeding $^1/_3$ of the length of the anterior division, genital segment shorter than the 2 succeeding segments combined, anal segment rather small. Caudal rami about twice the length of the anal segment, and somewhat flattened, all the 5 marginal setæ richly plumose, the innermost but one the longest. Length of anterior antennæ scarcely exceeding that of cephalosome, the left one slightly longer than the right, bristles of the anterior edges in both antennæ partly ciliated. Posterior antennæ with the distal joint of the inner ramus about the length of the proximal one. Last pair of legs with the inner projection of 2nd joint comparatively small, and cylindric in form, carrying at the tip a small denticle and a slender plumose seta; terminal joint fully twice as long as the other 2 combined, and armed with 6 strong spines, 4 of which issue from the outer edge, and 2 from the tip, inner edge straight and perfectly smooth.

Male resembling the female, but somewhat less robust, and with the urosome narrower and 5-articulate. Left anterior antenna with the middle section slightly tumefied, terminal section comparatively short and imperfectly biarticulate. Last pair of legs only slightly asymmetrical, penultimate joint in both legs lamellarly expanded, with a single spine outside, terminal joint of right leg transformed to a slender claw carrying 2 small spines outside the base, that of left leg spatulate, with 3 short spines at the end.

Colour not yet ascertained. Length of adult female 1.20 mm., of male 1.10 mm.

Remarks.—This form was first described by Th. Scott from some female specimens found in dredged material from Loch Fyne, Scotland. In its external

appearance it differs considerably from the ordinary Calanoid type, resembling rather, in this respect, the *Cyclopoida*, which may have been Th. Scott's reason for placing it in the family *Misophriidæ*.

Occurrence. Only 2 or 3 specimens of this remarkable form have hitherto come under my notice. They were taken many years ago at Christiansund, west coast of Norway, the exact depth not being recorded. On a closer examination, one of the specimens turned out to be an adult male, though at first I did not recognise it as such, on account of the inconspicuous sexual characters.

Distribution.—Scottish coast (Th. Scott).

Fam. 19. Pseudocyclopidæ.

Characters.—Body quite cyclopoid in appearance, though, as in other Calanoids, having the last segment of metasome firmly connected with the preceding one. Cephalosome well defined from the 1st pedigerous segment, front acutely produced below, and without any tentacular appendages. Urosome consisting in female of 4, in male of 5 segments. Anterior antennæ very short, with the number of articulations reduced; right antenna in male distinctly geniculate. Posterior antennæ with both rami well developed. Oral parts on the whole built upon the calanoid type. Legs robust, cyclopoid in shape, with both rami 3-articulate; last pair in female resembling in structure the preceding pairs, in male much transformed, prehensile.

Remarks.—This family has been established by Dr. Giesbrecht, to include the genus *Pseudocyclops* of Brady, which was erroneously placed by the latter author in the family *Misophriidæ*. Among the more prominent characters distinguishing this family, may be named the structure of the last pair of legs, these being biramous and natatory in the female, whereas in the male they are transformed to very large and compact prehensile organs, somewhat recalling the copulative appendages in the Ostracoda. We only know at present of a single genus belonging to this family.

Gen. 24. **Pseudocyclops,** Brady, 1872.

Generic Characters.—Body short and compact, with the anterior division considerably tumefied. Cephalosome strongly vaulted, and projecting below in a sharply pointed rostrum, which in the male is movably connected with the head. Last segment of metasome rather small, but distinctly defined from the preceding one. Urosome with the anal segment very small. Caudal rami short, with the outermost seta spiniform. Eye distinctly developed. Anterior antennæ scarcely longer than the cephalosome, and composed of 15 to 18 articulations; right antenna in male distinctly geniculate, with the terminal part 4-articulate. Posterior antennæ somewhat cyclopoid in shape, the distal joint of the inner ramus being connected with the proximal one at nearly a right angle, outer ramus about same length as the inner, and only 3-articulate. Mandibles with the palp distinctly biramous. Maxillæ with the inner ramus of the palp considerably produced. Anterior maxillipeds rather compact, with all the digitiform lobes distinct, appendages of terminal part comparatively small, setiform. Posterior maxillipeds scarcely longer than the anterior and somewhat resembling those in the genus *Eurytemora*. The 4 anterior pairs of legs rather powerful, with strong spines outside the outer ramus. Last pair of legs in female with the natatory setæ much reduced in size, inner ramus short, biarticulate or triarticulate; those in male somewhat asymmetrical, right leg the larger and hooked at the tip, inner ramus lamellar.

Remarks. This genus, as stated above, was placed by its founder, Prof. Brady, in the family *Misophriidæ*, apparently on account of some resemblance in its external appearance to the genus *Misophria*. As subsequently shown by Dr. Giesbrecht, it is however very different, not even belonging to the same division; and, as it also differs considerably from the other true Callanoids, its rank as the type of a distinct family is fully justified. It is only to be regretted, that the name of another Calanoid family, *Pseudocyclopiidæ*, founded on the genus *Pseudocyclopia* of Scott, is so very like that of the present family. We know at present of 3 species of this genus, one from the Bay of Naples, and 2 from the Scottish coast. One of the latter is also found off the Norwegian coast, and will be described below.

56. Pseudocyclops obtusatus, Brady.

(Pl. LXXXVIII).

Pseudocyclops obtusatus, Brady & Robertson, in Ann. Nat. Hist. ser. IV, Vol. XII, p. 128. Pl. VIII, figs. 4—7.

Specific Characters.—Female. Anterior division of body, seen dorsally, oval in form, greatest width slightly exceeding half the length, and occurring in the middle, anterior extremity evenly rounded, posterior somewhat contracted; seen laterally, considerably vaulted above. Cephalosome occupying nearly half the anterior division, dorsal margin forming an even curve as far as the tip of the rostrum; the latter rather strong, slightly curved, and terminating in a sharp point. Last segment of metasome very small, with the lateral lobes narrowly rounded. Urosome comparatively short, scarcely exceeding $^1/_3$ of the length of the anterior division, anal segment almost obsolete. Caudal rami scarcely longer than they are broad, innermost but one of the apical setæ much longer than the others. Eye rather large, subdorsal. Anterior antennæ, when reflexed, scarcely reaching beyond the cephalosome, and consisting of 18 articulations, bristles partly ciliated. Posterior antennæ with the distal joint of the inner ramus fully as long as the proximal one. Last pair of legs with the inner ramus distinctly 3-articulate; terminal joint of outer ramus with 4 natatory setæ inside.

Male somewhat smaller than female, and having the rostral projection sharply defined at the base. Urosome much more slender than in female, with some of the segments slightly produced dorsally. Right anterior antenna with the middle section somewhat tumefied. Last pair of legs very massive, basal part of both legs considerably tumefied, and on right side biarticulate, on left uniarticulate; outer ramus with a strong deflexed spine outside, and terminating on the right leg in 2 slender juxtaposed claws, on left leg in a peculiarly contorted, incurved piece; inner ramus on both legs lamellar.

Colour.—Body pellucid, whitish, with a slight rosy tinge along the ventral face.

Length of adult female 0.80 mm., of male 0.70 mm.

Remarks.—This form was first recorded by Brady and Robertson in the above-mentioned journal, and was subsequently re-described by the first-named author in his well-known Monograph of the British Copepoda. The specific name *obtusatus* seems to refer to the obtusely rounded frontal part. The rostrum is also said to be short and blunt, and is so represented in the figure of the male given; but this may be due to the fact of the rostral plate having accidentally been detached in the specimen examined.

Occurrence.—Only 3 specimens, one female and 2 males, have hitherto come under my notice. They were taken many years ago at Christiansund, from a depth of about 30 fathoms.

Distribution.—Scottish coast (Brady).

Fam. 20. Candaciidæ.

Characters.—Body quite calanoid in appearance. Cephalosome well defined from the 1st pedigerous segment, front abruptly deflexed, but without any distinct rostrum or tentacular appendages. Last segment of metasome confluent with the preceding one, and having the lateral parts expanded in both sexes. Urosome consisting in female of 3, in male of 5 segments. Caudal rami comparatively short, with the full number of setæ. Anterior antennæ slender and attenuated, with the number of articulations less reduced than in the 2 preceding families; right antenna in male geniculate. Posterior antennæ with the inner ramus imperfectly defined from the basal part, outer ramus comparatively small, with the terminal joints very short. Oral parts, especially the maxillæ, rather different in their structure from those in other Calanoids. Anterior maxillipeds much larger than the posterior. The 4 anterior pairs of legs with the inner ramus consisting of only 2 joints. Last pair of legs comparatively small and of simple structure, not natatory; those in male rather asymmetrical. No ovisac present in female.

Remarks.—This family was established by Dr. Giesbrecht, to include the genus *Candacia* of Dana, which differs considerably in some respects from the Calanoids treated of in the preceding pages, and forms, as it were, a transition to the *Pontellidæ*. We do not know at present of more than this one genus; but it is not improbable that in future it will be found convenient to divide it into 2 nearly-allied genera, as at any rate the structure of the last pair of legs in the male presents 2 very different types.

Gen. 25. **Candacia,** Dana, 1846.

Syn: *Candace,* Dana.
„ *Iphionyx,* Kröyer.

Generic Characters.—Body generally rather robust, with the anterior division more or less vaulted above, front narrowly truncate, with 2 juxtaposed knob-like prominences below. Lateral corners of last segment of metasome more or less produced, and, as a rule, asymmetrical in the male. Urosome of moderate size, sometimes conspicuously asymmetrical in female; 1st segment in male with a projection on right side. Caudal rami comparatively small, setæ subequal. Eye present or wanting. Anterior antennæ consisting in female of 23 or 24 articulations, the proximal ones somewhat irregular and partly dentate in front; right antenna in male distinctly geniculate, with the terminal section very slender, 5-articulate. Posterior antennæ with the outer ramus much smaller than the inner and 5-articulate, 2nd joint much the largest. Mandibles with the masticatory part very narrow and bifurcate at the tip, palp well developed, with the basal part rather broad. Maxillæ with the proximal appendicular lobe excessively prolonged, rod-like, and carrying 3 unequal, incurved spines at the tip, inner ramus of palp bent abruptly outwards, and having one of the apical setæ excessively prolonged, outer ramus wanting. Anterior maxillipeds exceedingly large and powerful, being armed distally with a restricted number of very strong falciform claws, digitiform lobes rudimentary. Posterior maxillipeds much reduced in size, though of normal structure. Natatory legs with the rami very unequal, the outer one much the larger and finely serrate along the exterior edge, terminal joint occupying more than half the length of the ramus, and armed outside with 3 comparatively small spines. Last pair of legs in female very small, 3 articulate, in male somewhat larger, left leg 4-articulate, right 3-articulate and terminating in some species with an imperfect chela, in others with a slender deflexed, ciliated seta.

Remarks.—This genus was established by Dana as early as the year 1846. The name *Candacia* originally proposed was subsequently changed by the same author to *Candace,* and the latter name has been generally used by subsequent carcinologists. Dr. Giesbrecht, however, in his recent synopsis, has restored the original name *Candacia,* and accordingly the name of the family must be changed from *Candacidæ* to *Candaciidæ.* The genus *Iphionyx* of Kröyer it unquestionably identical with Dana's genus. We know at present of a considerable number of species belonging to this genus, amounting to about 16 in

all. Two of these have been found off the coast of Norway, and will be described below. A 3rd Norwegian species, *C. elongata*, has been recorded by Boeck; but it is impossible to recognise this form, which in all probability does not belong to the genus *Candacia* at all, as the lateral parts of the last segment of the metasome are said to be rounded off, a character not found in any of the other known species.

57. Candacia norvegica, Boeck.

(Pl. LXXXIX & XC).

Candace norvegica, Boeck. Oversigt over de ved Norges Kyster iagttagne Copepoder. Chr. Vid. Selsk. Forh. 1864, p. 235.

Specific Characters.—Female. Body, as compared with that in the other species, rather slender, with the anterior division, seen dorsally, oblong in form, greatest width but slightly exceeding $^1/_3$ of the length, anterior extremity considerably contracted, and transversely truncated at the tip, posterior scarcely at all attenuated, and only very slightly emarginated in the middle. Cephalosome occupying more than half the length of the anterior division, rostral prominence very small, bi-tuberculate. Lateral parts of last segment of metasome terminating in a short somewhat outwards-pointing corner, acute at the tip. Urosome perfectly symmetrical, and equalling about $^1/_3$ of the length of the anterior division, genital segment slightly tumefied in its anterior part, and armed on each side with a small posteriorly-pointing spine. Caudal rami shorter than the preceding segment, all 5 setæ of about same length, the outermost issuing from a separate ledge of the outer edge. Eye wholly absent. Anterior antennæ very slender and elongated, reaching, when reflexed, beyond the tip of the caudal rami, and composed of 24 articulations. Anterior maxillipeds exceedingly large, with the claw-like spines unusually strong. Apical spine of outer ramus in the 2nd to 4th pairs of legs exceeding half the length of the terminal joint. Last pair of legs very small, terminal joint scarcely longer than the other 2 combined, and projecting at the tip in 2 unequal spines; outer edge armed with 2 or 3 small denticles, inner with 3 short setæ.

Male still more slender than female, with the right corner of last segment of metasome produced to a highly chitinised, dark-coloured, somewhat incurved projection, left corner about as in the female. Genital segment with the projection on right side rather large and irregularly tubercular at the tip. Right anterior antenna with the middle section only slightly tumefied, and having

at the end anteriorly a finely serrate lamella. Right last leg terminating in a pair of obtuse scissors formed by the last 2 joints.

Colour. Body in both sexes highly pellucid and almost colourless.

Length of adult female 3.20 mm., of male about the same.

Remarks.—This form was briefly mentioned by Boeck in the above-mentioned journal; but no figures or detailed description have as yet been given, for which reason it is placed by Dr. Giesbrecht, in his recent synopsis, among the doubtful species of the genus. Boeck considers it to be most nearly allied to *C. bispinosa* of Claus, probably on account of the similar armature of the genital segment in the female. It is evidently much more closely related, however, to another species described by the same author, viz., *C. longimana,* though it also differs from this species in some characters, e. g. in the total absence of eye, the much more elongated anterior antennæ, and the somewhat different structure of the last pair of legs, especially in the female.

Occurrence.—Boeck first recorded this form from the Hardanger Fjord. I have myself found it occasionally in the following localities: at Hankø, lower part of the Christiania Fjord, at Jelsø, upper part of the Stavanger Fjord, at Kalvaag, west coast of Norway, and at Skraaven, Lofoten Islands, in all these places only from depths of more than 150 fathoms. The same form has also been found by Mr. Nordgaard in the neighbourhood of Bergen, and a male specimen was sent to me by Prof. Cleve, who found it in a plankton-sample taken from great depth in the Skagerak. This species has not yet been recorded, however, elsewhere than from the Norwegian Sea

58. Candacia armata, Boeck.

(Pl. XCI).

Candace armata, Boeck. Nye Slægter og Arter af Saltvands-Copepoder. Chr. Vid. Selsk. Forh. 1872, p. 39.

Syn: *Candace pectinata*, Brady.

Specific Characters.—Female. Body much more robust than in the preceding species, with the anterior division considerably vaulted above, and, seen dorsally, oval fusiform in shape, greatest width nearly attaining half the length and occurring in the middle, anterior extremity abruptly contracted and transversely truncated at the tip, posterior slightly attenuated. Last segment of metasome deeply emarginated in the middle, lateral corners produced to acute posteriorly-pointing projections reaching beyond the middle of the genital segment.

Urosome conspicuously asymmetrical, genital segment somewhat irregularly dilated in the middle, and without any lateral spines, 2nd segment forming below a sacciform dilatation turned somewhat to right side, last segment with an irregular dorsal lappet curved to left side. Caudal rami likewise somewhat asymmetrical, the left one being smaller than the right; setæ about as in *C. norvegica*. Eye present, but very small, sub-ventral. Anterior antennæ much shorter than in *C. norvegica*, when reflexed scarcely reaching beyond the genital segment, and consisting of only 23 articulations. Anterior maxillipeds rather large, but with the claw-like spines less strong than in *C. norvegica*. Apical spine of outer ramus in 2nd to 4th pairs of legs very short, not nearly attaining half the length of the terminal joint. Last pair of legs with the terminal joint much longer than the other 2 combined, and falciform in shape, tapering distally, and terminating in a simple acute point, outer edge with 3 extremely small denticles, one of which is placed at rather a long distance from the other 2, inner edge perfectly smooth.

Male more slender than female, with the right projection of last segment of metasome slightly larger than left, but scarcely incurved. Urosome without any sacciform dilatation below, genital segment with the projection on right side simple, acuminate. Right anterior antenna with the middle section considerably more tumefied than in *C. norvegica*, and having at the end anteriorly a very coarsely serrate, dark-coloured lamella. Right last leg terminating in a somewhat irregular chela formed by the last 2 joints.

Colour. Body semipellucid, with a faint yellowish tinge, and exhibiting on the dorsal face of the anterior division a double row of small dark blue patches.

Length of adult female 2.70 mm., of male about the same.

Remarks.—The above-described form is unquestionably Boeck's *Candace armata*. Owing to the imperfect manner in which it was recorded by that author, it was, however, not recognized by subsequent carcinologists, and it has accordingly been recorded under the name proposed by Brady several years later, viz., that of *Candace pectinata*. It may be observed that, according to Dr. Giesbrecht, the form described under this name from the Challenger Expedition, is a different species, viz., *Candacia curta* of Dana. From most other species the present form may be easily recognized, at any rate in the female sex, by the peculiar asymmetry of the urosome.

Occurrence.—Boeck did not record the locality where he found this form. Most probably it was Haugesund, west coast of Norway, where he made most of his collections. I have myself taken it occasionally off Mærdø, outside Arendal, and in the lower part of the Christiania Fjord, at Hankø. All the specimens were procured by the aid of the tow-net near the surface of the sea. The same

species has also been taken by Mr. Nordgaard in the neighbourhood of Bergen; and 2 specimens were further found in a plankton-sample taken during the cruise of the "Michael Sars" in 1901, at Stat. 11, located east of Iceland.

Distribution.—British Isles (Brady), Atlantic Ocean, between Lat. 33° and 50° N. (Cleve), Mediterranean (Giesbrecht).

Fam. 21. Pontellidæ.

Characters. Body generally strongly built, with the anterior division more or less fusiform in shape. Cephalosome well defined from the 1st pedigerous segment, and having often laterally a hook-like projection, front produced below to a strong bifurcate rostrum. Last segment of metasome with the lateral parts, as a rule, produced behind. Urosome in female generally asymmetrical, with the number of segments more or less reduced. Caudal setæ present in the normal number. Visual organs, as a rule, highly developed, consisting of a single protuberant ventral eye and 2 well defined dorsal eyes, each often provided with one or 2 cuticular lenses. Anterior antennæ in female 16—24-articulate; right antenna in male distinctly geniculate, with the middle section generally greatly tumefied. Posterior antennæ resembling in structure those in the *Candaciidæ*. Mandibles and maxillæ on the whole normal. Anterior maxillipeds strongly built, with long, anteriorly-curving spiniform setæ, digitiform lobes well developed. Posterior maxillipeds much smaller than the anterior, with the 1st basal joint more or less expanded and carrying long setæ, remaining part very narrow, and clothed with very short setæ. The 4 anterior pairs of legs of normal structure, with the inner ramus shorter than the outer and generally biarticulate. Last pair of legs not natatory in either of the sexes, though in female generally biramous; those in male very asymmetrical, right leg more or less pronouncedly cheliform. No ovisac present in female.

Remarks.—This family, answering to the subfamily *Pontellina* of Giesbrecht, comprises a number of Calanoids, which are distinguished by their strongly built body and the often vivid blue colour with which they are ornamented. Of all the known Calanoida, they seem to be those which have reached to the highest degree of development, this being manifested both by their unusually energetic movements and the generally complicated structure of the visual organs. In the

restriction here adopted, the family comprises 7 distinct genera, viz., *Anomalocera* Templeton, *Labidocera* Lubbock, *Pontella* Dana, *Pontellopsis* Brady, *Ivellopsis* Claus, *Monops* Lubbock, *Pontellina* Dana and *Calanopia* Dana. Of these genera, only the first 2 are represented in the fauna of Norway; the others are characteristic of the tropical parts of the oceans.

Gen. 26. **Anomalocera,** Templeton, 1837.

Syn: *Irenæus,* Goodsir.
„ *Pontia,* Kröyer (part).

Generic Characters.—Body comparatively slender, with the anterior division oblong in form. Cephalosome with distinct lateral hooks, rostrum very strong, with the rami abruptly deflexed and acute at the tip. Last segment of metasome well defined from the preceding one, and having the lateral lobes in female triangularly pointed, in male conspicuously asymmetrical. Urosome in female consisting of 3, in male of 5 segments; caudal rami more slender in male than in female, in the latter conspicuously asymmetrical. Dorsal eyes well developed and of the same appearance in both sexes, each with 2 cuticular lenses; ventral eye in male enormously developed, club-shaped. Anterior antennæ not very elongated, consisting in female of 21 articulations; right antenna of male greatly swollen in the middle. Posterior antennæ with the inner ramus well defined from the basal part, outer very small, 5-articulate. Mandibles with 7 denticles on the cutting edge, the outer 2 claw-shaped, palp rather robust. Maxillæ with the proximal appendicular lobe much larger than the distal one. Maxillipeds exhibiting the structure characteristic of the family. First pair of legs with the inner ramus 3-articulate. Last pair of legs in female with the rami very unequal, the outer one slender, biarticulate, inner very small, bidentate at the tip; right leg in male with the chela not very strong and having both the dactylus and thumb obtuse at the tip.

Remarks.—This genus was established by Templeton as early as the year 1837. The genus *Irenæus* of Goodsir is identical with that of Templeton. It is nearly related to the typical genus *Pontella* of Dana, differing however rather materially in some points, e. g. in the presence of 2 pairs of dorsal eye-lenses, the comparatively short anterior antennæ, and the structure of the last pair of legs in both sexes. We know at present of only a single species, to be described below.

59. Anomalocera Patersoni, Templeton.

(Pl. XCII—XCIV).

Anomalocera Patersoni, Templeton, in Transact. Entom. Soc. London. Vol. II, p. 35, Pl. V, figs. 1—3.

Syn: *Irenæus splendidus*, Goodsir.
„ *Pontia Patersoni*, Kröyer.
„ *Pontella Eugeniæ*, Leuckart.

Specific Characters.—Female. Anterior division of body but very slightly vaulted above, seen dorsally, oblong in form, greatest width equalling about $^1/_3$ of the length, and occurring about in the middle, anterior extremity rather broad and triangularly pointed at the tip, posterior gradually somewhat attenuated. Cephalosome about the length of the 3 succeeding segments combined, and somewhat depressed in its anterior part, lateral edges forming on each side, somewhat in front of the middle, a well-marked hook-like projection, rostrum abruptly deflexed, with the rami rather strong and acutely pointed. First segment of metasome considerably larger than the succeeding ones, last segment comparatively small, with the lateral lobes of moderate size and triangularly pointed. Urosome considerably exceeding half the length of the anterior division, and somewhat asymmetrical, being generally turned out of the axis of the body to the right, genital segment somewhat tumefied in the middle and produced ventrally on right side to a narrow rod-like projection. Caudal rami conspicuously unequal, left ramus constricted at the base and gradually widening distally, right considerably larger and more exstant, with the outermost seta quite short, both rami very finely ciliated inside. Ventral eye comparatively small, though distinctly protuberant, dorsal eyes well developed, corneal lenses placed at some distance from them, near the lateral edges. Anterior antennæ, when reflexed, reaching about to the end of the 3rd pedigerous segment, being generally extended obliquely anteriorly in the living animal, proximal part somewhat dilated, distal part rather slender. Posterior antennæ with the inner ramus rather fully developed, outer, on the other hand, very small, scarcely exceeding in length the proximal joint of the inner, and much narrower. Natatory legs with the apical spine of the outer ramus rather slender and coarsely dentate outside. Last pair of legs with the outer ramus narrow and elongated, about twice the length of the basal part, proximal joint linear in form, with 2 small spines outside, and produced at the tip inside to a slender spiniform process, distal joint rather small, carrying 3 spines on the tip, the innermost much the largest and finely denticulate inside; inner ramus very small, and produced at the end to 2 subequal diverging denticles.

Male somewhat more slender than female, and having the last segment of metasome conspicuously asymmetrical, right lateral lobe much larger than left, and produced to a slender, somewhat inflexed process. Urosome much narrower than in female, and, as usual, 5-articulate, 1st joint on right side produced in a triangular projection, the 2 succeeding segments slightly asymmetrical. Caudal rami much more elongated than in female, and nearly equal. Ventral eye of extraordinary size, sub-pedicellate or club-shaped, extending obliquely anteriorly, its broadly rounded end being received between the rami of the rostrum. Right anterior antenna with the middle section bulbously tumefied in its proximal part, and carrying a slender spine pointing obliquely inwards, the last 2 joints of this section attenuated, and each provided in front with a finely serrate lamella. Last pair of legs without any trace of an inner ramus, left leg with the terminal joint comparatively small, incurved, projecting at the tip to a short claw, and carrying 3 small spines outside; right leg with the chela sub-quadrangular in form, thumb very small, dactylus somewhat spoon-shaped.

Colour. Body generally of a fine bluish green colour, with a number of irregular dark patches on the dorsal face of the anterior division arranged in a double row, 1st and 2nd pedigerous segment each with a median dorsal pigment-star, consisting of a dark nucleus and numerous radiating fibres of a silvery hue; ventral eye indigo blue.

Length of adult female 3.20 mm., of male 3.00 mm.

Remarks.—This handsome Calanoid was first described under the above name by Templeton, and was some years afterwards recorded by Goodsir under another name, viz., *Irenæus splendidus*. Kröyer referred the species to the genus *Pontia* of Milne-Edwards (= *Pontella* Dana). It is an easily recognizable form, and perhaps one of our most beautiful Calanoids, being clearly distinguished both by its unusual colouring and the very full development of the visual organs, especially in the male.

Occurrence.—I have met with this form in several places, both off the south and west coasts of Norway, generally congregated in great shoals. The true habitat of this form, however, is undoubtedly the open ocean, and it is only after heavy gales, and by the accompanying strong sea-currents, that it is occasionally brought close to the shores and into the fjords. Under such circumstances I have found it rather plentifully at the Biological Station at Drøbak, and sometimes even in the uppermost part of the Christiania Fjord, close to the town. Off the west coast of Norway, where it is known to the fishermen as "Blaaaate" (blue bait), its presence in the fjords is a very good sign of the approach of the summer-herring. It is always found swimming close to the surface of

the sea, often jumping out of the water; and, as it generally occurs in great abundance, the presence of this Calanoid in calm weather may be easily observed by a slight disturbance of the surface, as if by fine rain. The movements of this Calanoid are exceedingly rapid and energetic, and indeed, when kept alive in a bottle with sea-water, it is a matter of great difficulty to catch the specimens with the ordinary implements, viz., a small feather or a dipping-tube. When brought under the microscope in a small quantity of water, the animal immediately jumps off the object-glass, and in order to prevent its escape, it is therefore necessary to add to the water a little alcohol or other narcotizing fluid.

Distribution.—British Isles (Brady), coast of France (Canu), Mediterranean (Claus), Atlantic Ocean, between Lat. 36° and 67° N. (Giesbrecht), Black Sea (Karawajew).

Gen. 27. **Labidocera,** Lubbock, 1853.

Syn: *Pontella*, Dana (part.).
„ *Hemipontella*, Claus.

Generic Characters.—Body less slender than in *Anomalocera,* with the anterior division more tumefied. Cephalosome with or without lateral hooks, rostrum about as in *Anomalocera,* but somewhat smaller. Last segment of metasome confluent with the preceding one, lateral lobes more or less produced behind. Urosome in female comparatively short and composed of 2 or 3 segments, that in male 5-articulate, genital segment in female generally asymmetrical. Caudal rami of moderate size, sometimes conspicuously unequal in female. Ventral eye of same appearance in the 2 sexes, dorsal eyes each with a single cuticular lense, rather small in female, greatly developed in male. Anterior antennæ slender and elongated, consisting in female of 23 articulations; right antenna in male with the middle section moderately tumefied. Posterior antennæ with the inner ramus confluent with the basal part, outer ramus larger than in *Anomalocera.* Oral parts on the whole resembling in structure those in that genus. Inner ramus in all the natatory legs biarticulate. Last pair of legs in female with both rami uniarticulate and less unequal than in *Anomalocera;* left leg in male sometimes with a rudimentary inner ramus, right leg terminating in a very large and perfect chela.

Remarks.—This genus, established by Lubbock, is chiefly distinguished from *Anomalocera* by the presence of only a single pair of dorsal ocular lenses,

which in the male are greatly developed, whereas the ventral eye is of the same appearance in both sexes. Moreover, the last segment of the metasome is confluent with the preceding one, and the inner ramus of the 1st pair of natatory legs is biarticulate, like that in the other pairs. Finally, the structure of the last pair of legs is somewhat different in the 2 sexes, the chela of the right leg in male being exceedingly large and powerful. We know at present of numerous species belonging to this genus, amounting to about 23 in all. One of these species has been found off the Norwegian coast, and will be described below.

60. Labidocera Wollastoni, Lubbock.

(Pl. XCV & XCVI).

Pontella Wollastoni, Lubbock, in Ann, nat. hist. ser. 2, Vol. 20, p. 406, Pl. 10, 11.

Syn: *Pontella helgolandica*, Claus.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong oval in form, greatest width exceeding $^1/_3$ of the length, and occurring behind the middle, anterior extremity somewhat contracted and narrowly rounded at the tip, posterior but slightly attenuated. Cephalosome exceeding in length the 3 succeeding segments combined, lateral hooks well marked, rostrum abruptly deflexed, with the rami acutely pointed. Lateral lobes of last segment of metasome triangular and perfectly symmetrical. Urosome comparatively short and thick, 3-articulate, not nearly attaining $^1/_3$ of the length of the anterior division, genital segment produced dorsally to a large sacciform expansion turned somewhat to the right, and quite overlapping the succeeding segment. Caudal rami symmetrical, with the setæ comparatively short and thick. Dorsal ocular lenses small and widely apart. Anterior antennæ very slender, reaching, when reflexed, about to the end of the 2nd caudal segment. Posterior antennæ with both rami rather slender, the inner one the longer. Last pair of legs rather robust, both rami well developed, lanceolate, without any denticles or setæ, the outer one the larger.

Male more slender than female, with the lateral lobes of last segment of metasome shorter and more obtuse. Urosome narrower and perfectly symmetrical, 1st segment not produced on right side. Caudal rami more elongate than in female, with the setæ rather slender. Dorsal ocular lenses exceedingly large and placed near together. Right anterior antenna with a hook-like projection on the penultimate joint of the middle section and a coarsely serrate lamella on the last one; antepenultimate joint of the terminal section produced at the end anteriorly to a slender, rod-like process. Last pair of legs very asymmetrical, left leg provided

with a thin deflexed lamella issuing from inside the basal part, and terminating in 2 unequal digitiform processes, terminal part somewhat complanate, biarticulate, with the distal joint discoidal and armed outside with 3 slender spines; right leg very strongly built, with the chela exceedingly large and tumid, both the dactylus and thumb sharply pointed, palmar edge irregularly indented, with an obtuse projection in the middle.

Colour.—Body semipellucid, with a yellowish green tinge, and in female generally with 3 dark yellow transverse patches on the dorsal face of the anterior division; dorsal ocular lenses in male highly refractive.

Length of adult female 2.40 mm., of male 2.20 mm.

Remarks.—This form was first described by Lubbock as a species of the genus *Pontella* of Dana. The *Pontella helgolandica* of Claus is unquestionably identical with Lubbock's species. It is easily recognized from the 2nd Norwegian Pontellid, *Anomalocera Patersoni,* though agreeing closely with some of the exotic species of the present genus.

Occurrence.—I have taken this form occasionally at Mærdø, outside Arendal, and in the lower part of the Christiania Fjord. Some few specimens were also found in a plankton-sample taken by Dr. Hjort in the Langesund Fjord, and Mr. Nordgaard has observed this form in the neighbourhood of Bergen. Like all the other Pontellidæ, it is a true pelagic form, occurring more generally in the open ocean, close to the surface of the sea.

Distribution.—British Isles (Brady), Heligoland (Claus), coast of France (Canu), Mediterranean (Giesbrecht), Atlantic Ocean, between Lat. 36° and 55° N. (Giesbrecht).

Fam. 22. Parapontellidæ.

Characters.—General form of body somewhat resembling that in the *Pontellidæ.* Cephalosome well defined from the 1st pedigerous segment, front without any rostrum, but carrying below 2 soft tentacular appendages. Last segment of metasome united with the preceding one, and in male conspicuously asymmetrical. Urosome composed in female of 3, in male of 5 segments. Caudal rami in both sexes perfectly symmetrical, with the full number of setæ. A small ventral eye present, and moreover a rather large central eye; no cuticular lenses

present. Anterior antennæ comparatively short, with the number of articulations somewhat reduced; right antenna in male distinctly geniculate. Posterior antennæ with both rami well developed. Oral parts, especially the mandibles and maxillæ, of rather anomalous structure. Anterior maxillipeds much more strongly built than the posterior. The 4 anterior pairs of legs resembling in structure those in the *Pontellidæ*. Last pair of legs not natatory in either of the sexes; in female biramous, in male uniramous, right leg in the latter not cheliform.

Remarks.—This family is here taken in a much more restricted sense than even the subfamily *Parapontellinæ*, which, according to Dr. Giesbrecht, comprises the 3 genera *Parapontella, Acartia* and *Corynura*. In my opinion, these 3 genera are so widely different, that each of them ought to be regarded as the type of a separate family. The present family accordingly, in the restriction here adopted, comprises only the genus *Parapontella* of Brady, which, although in some respects exhibiting a slight resemblance to the *Pontellidæ*, in reality differs very materially in several structural features, for instance in the want of the strong bifurcate rostrum characteristic of that family, in the very different structure of the posterior antennæ and oral parts, and finally in the not chelate right last leg of the male. The solitary species of the genus as yet known seems also to differ pronouncedly in habits from the *Pontellidæ*.

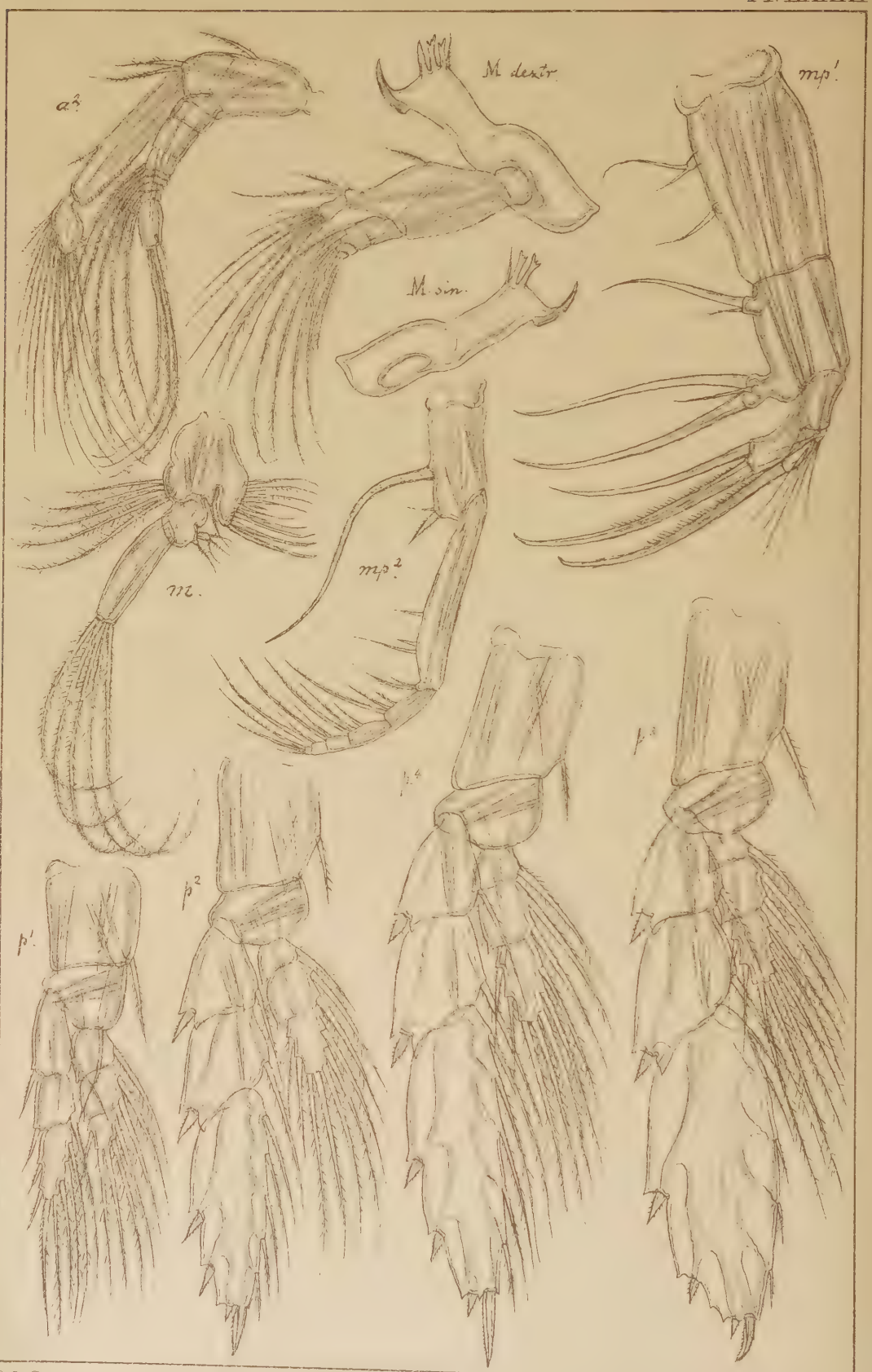
Gen. 28. **Parapontella,** Brady, 1878.

Syn: *Pontellina*, Lubbock (not Dana).

Generic Characters.—Body comparatively robust, with the anterior division considerably tumefied. Cephalosome well arched, front scarcely at all produced below, tentacular appendages very delicate, recurved. Lateral parts of last segment of metasome in female rounded off, in male produced on right side. Urosome in female perfectly symmetrical, in male with some of the segments produced on right side. Caudal rami sublinear in form, and of same appearance in the 2 sexes; all the setæ well developed. Anterior antennæ composed in female of 20 articulations, last one very small and imperfectly defined; right antenna in male with the joints of the middle section somewhat irregular, terminal section composed of only 2 joints. Posterior antennæ with the inner ramus imperfectly defined from the basal part, outer ramus longer than the inner. Mandibles rather strong, with the outer cutting teeth unguiform, palp of somewhat unusual

Copepoda

Calanoida.



G O Sars autogr

Heterorhabdus norvegicus, (Boek)
(continued)

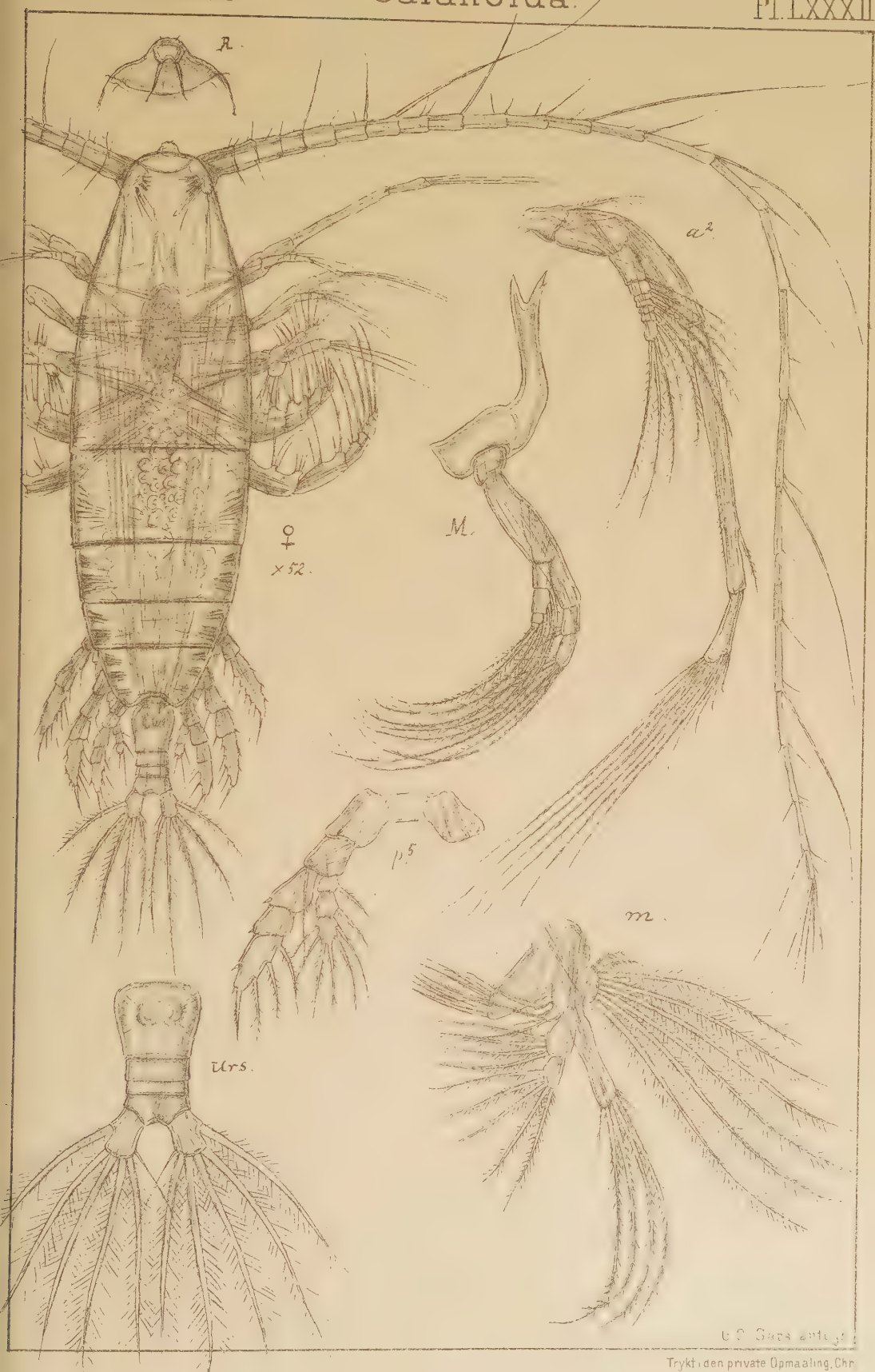
Trykt i den private Opmaaling, Chra

Copepoda

Calanoida.

Heterorhabdidæ

PI. LXXXII



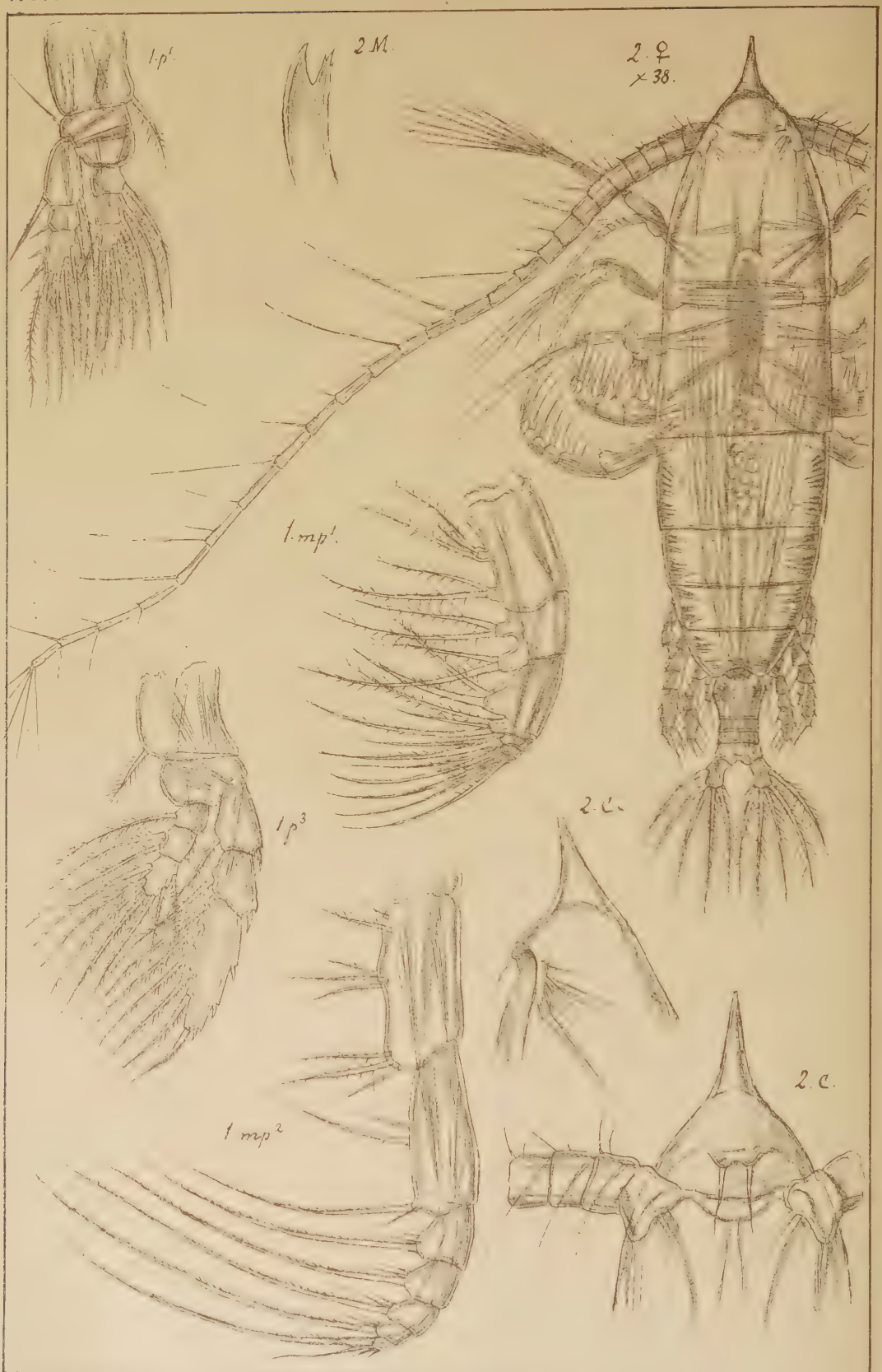
G. O. Sars del. et lith.

Trykt i den private Opmaaling, Chr.

Haloptilus longicornis, (Claus)

Copepoda

Calanoida.

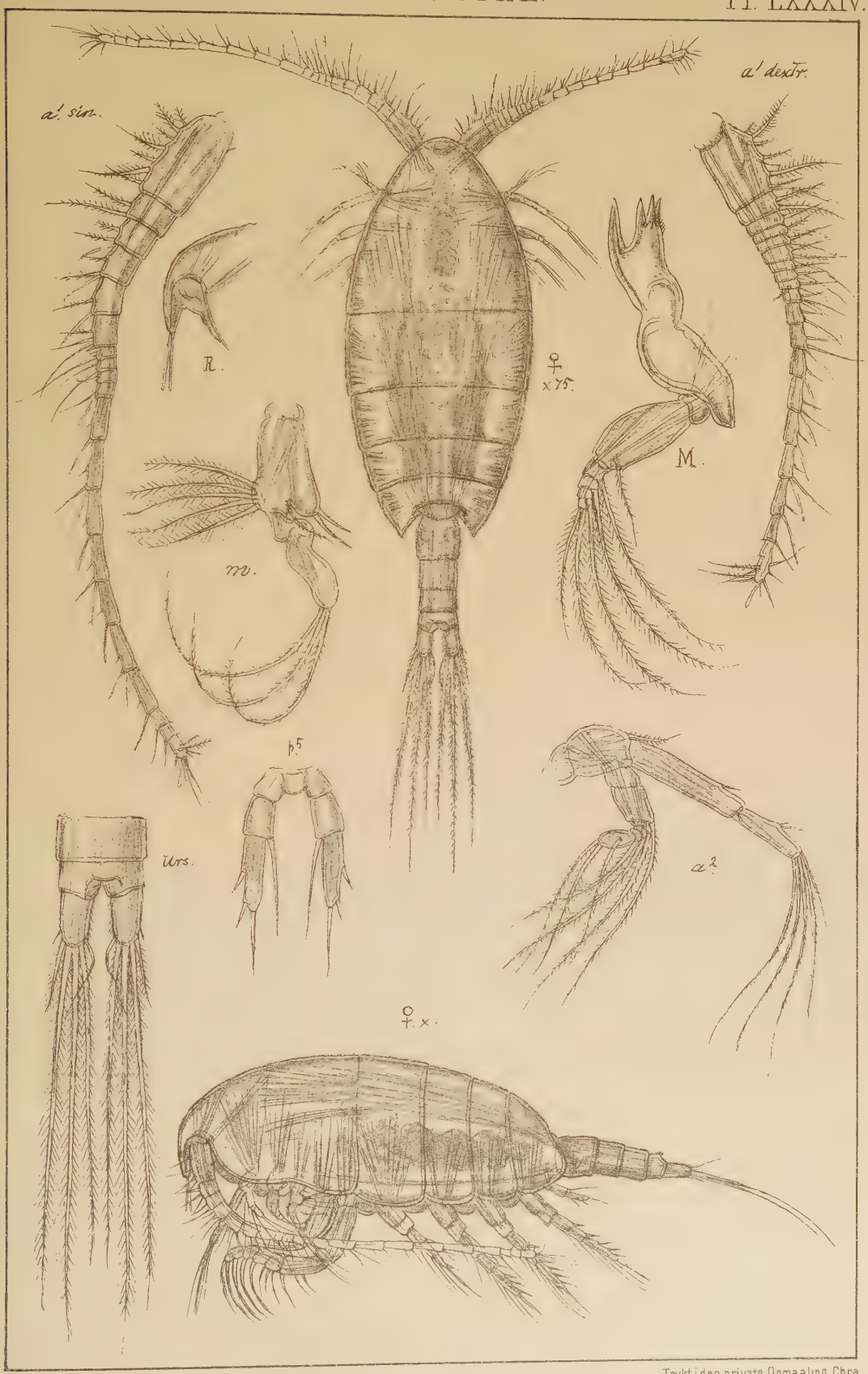


G O Sars auctor.

1 Haloptilus longicornis, (Claus)
(continued)
2 Haloptilus acutifrons, Giesbr.

Trykt i den private Opmaaling, Chra

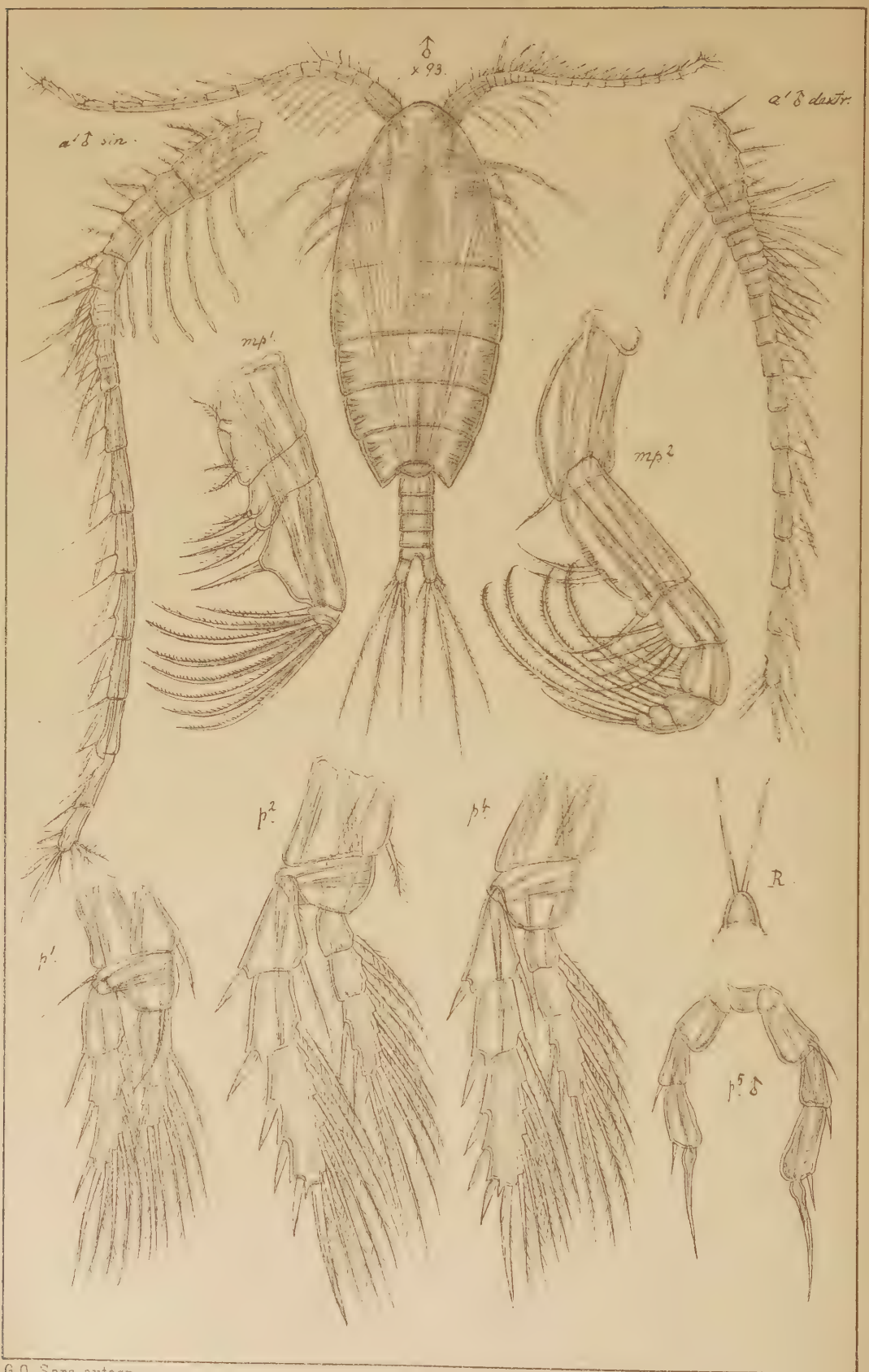
Copepoda
Calanoida.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Scottula inæqvicornis, G.O. Sars



G.O. Sars autogr

Trykt i den private Opmaaling, Chra

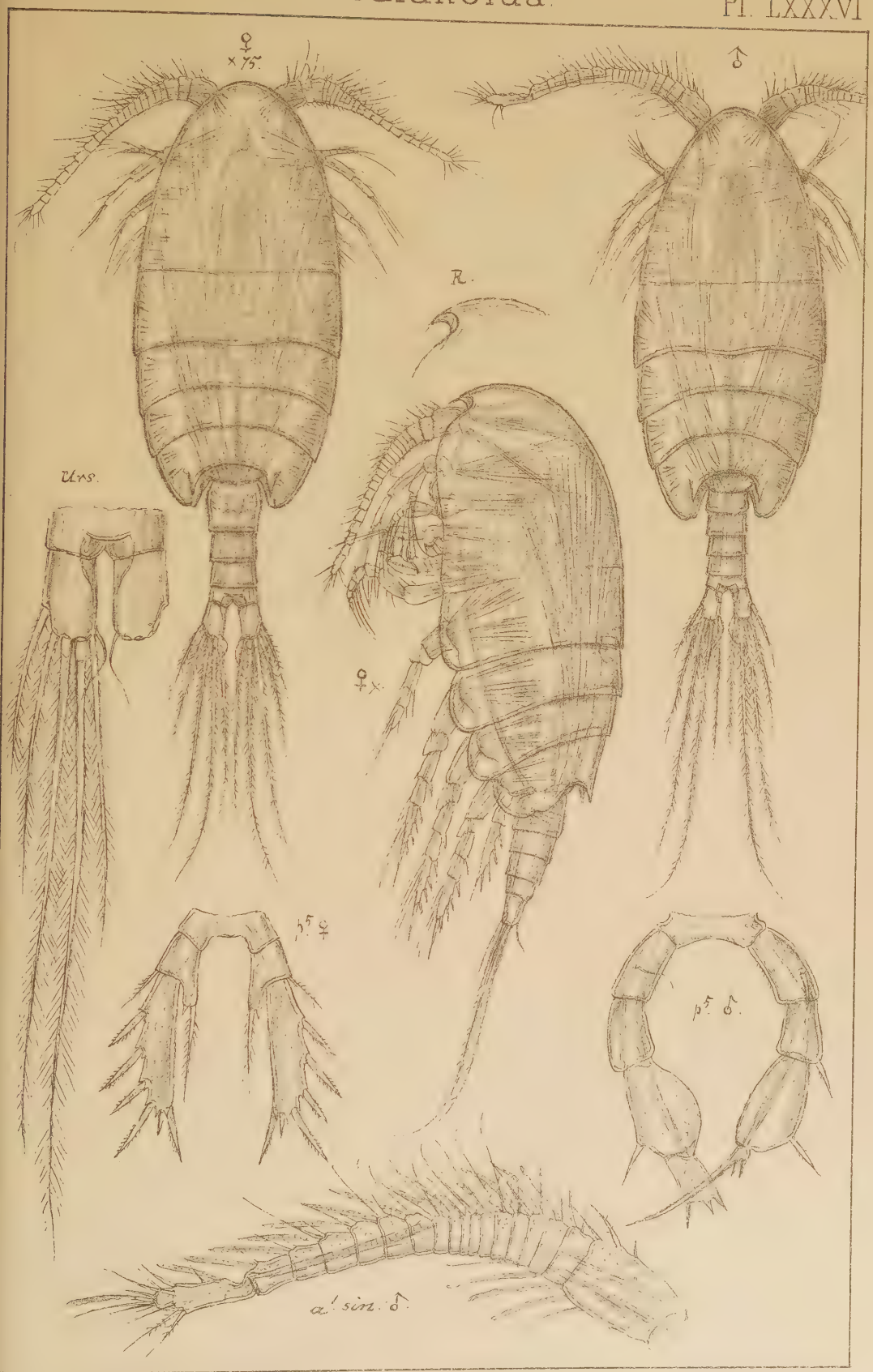
Scottula inæqvicornis, G.O. Sars
(continued)

Copepoda

Calanoida.

Arietellidæ

PI. LXXXVI



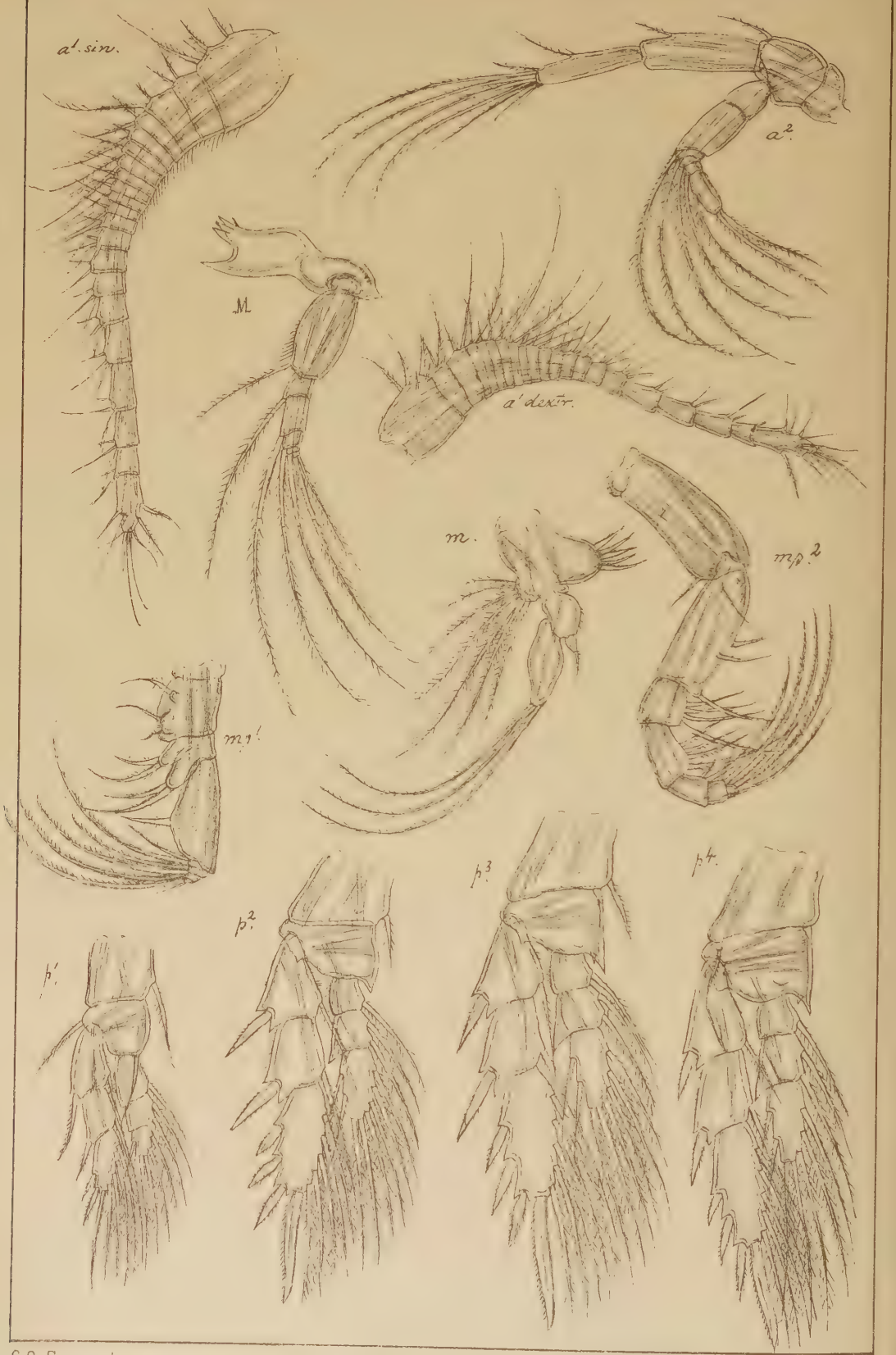
G O Sars autogr

Trykt i den private Opmaaling, Chra

Paramisophria Cluthæ, Scott

Copepoda

Calanoida.



G.O. Sars autogr

Trykt i den private Opmaaling. Chra

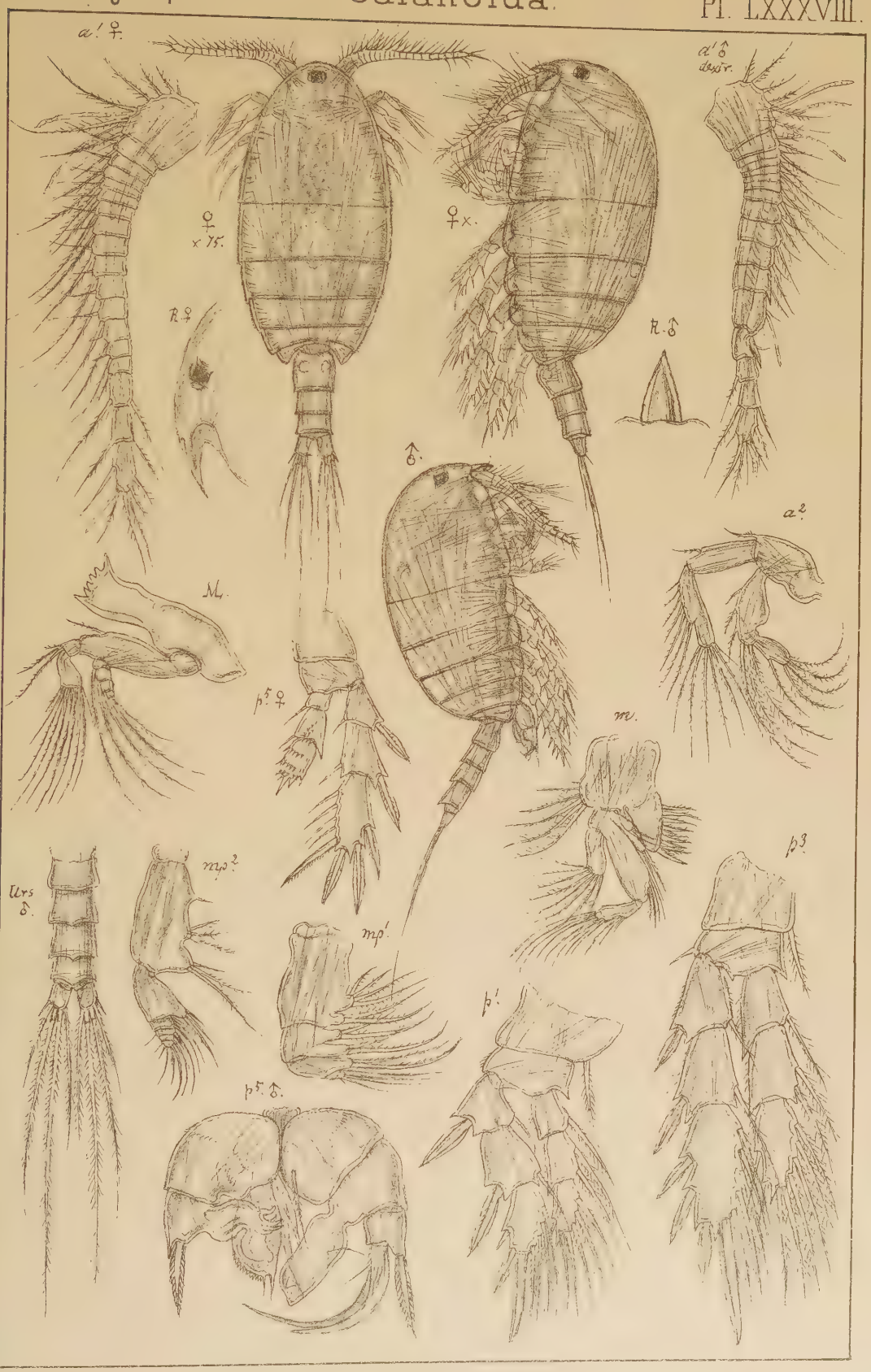
Paramisophria Cluthæ, Scott
(continued)

Copepoda

Calanoida.

Pseudocyclopidæ

PI. LXXXVIII.



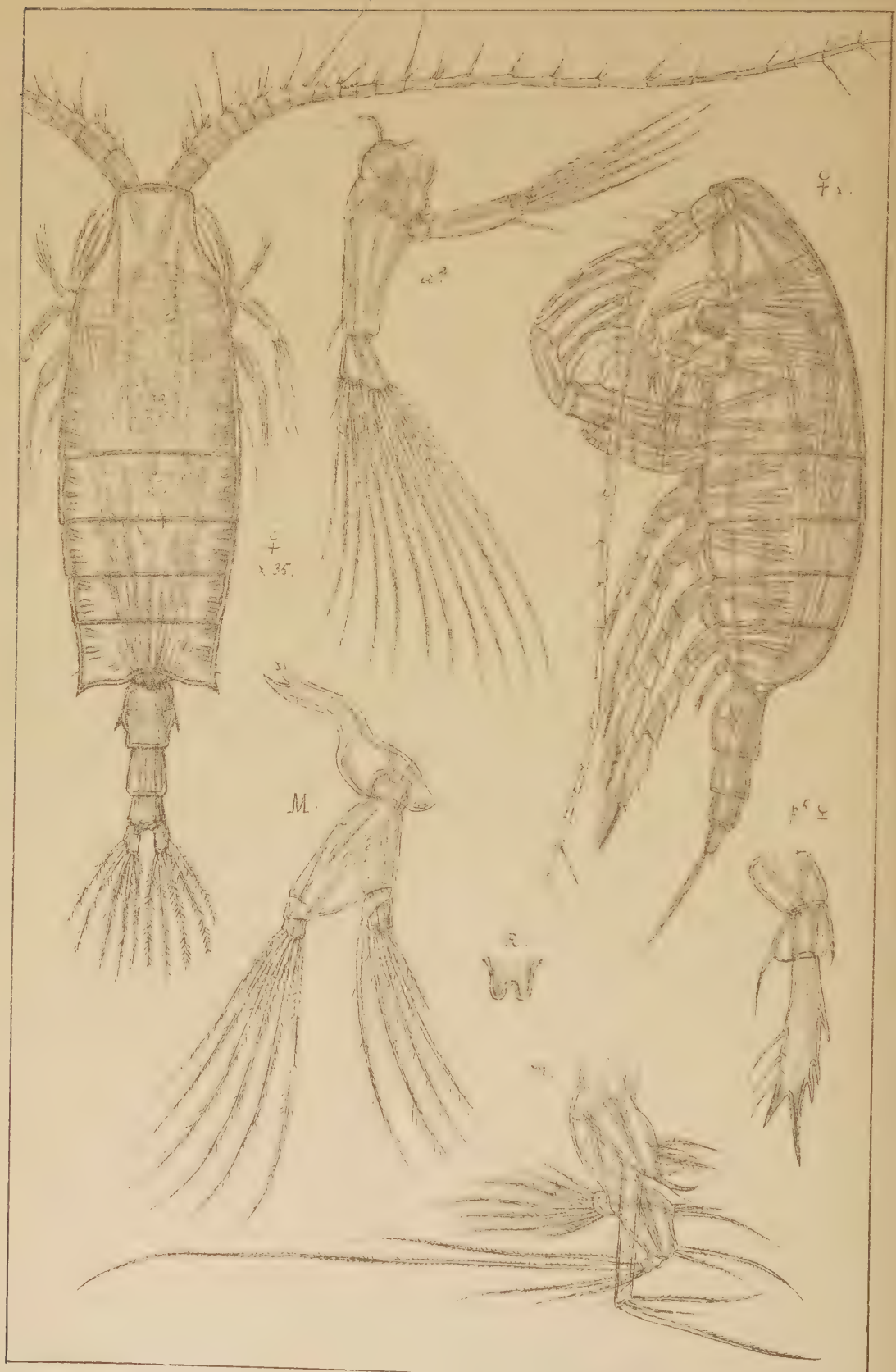
G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Pseudocyclops obtusatus, Brady

Copepoda

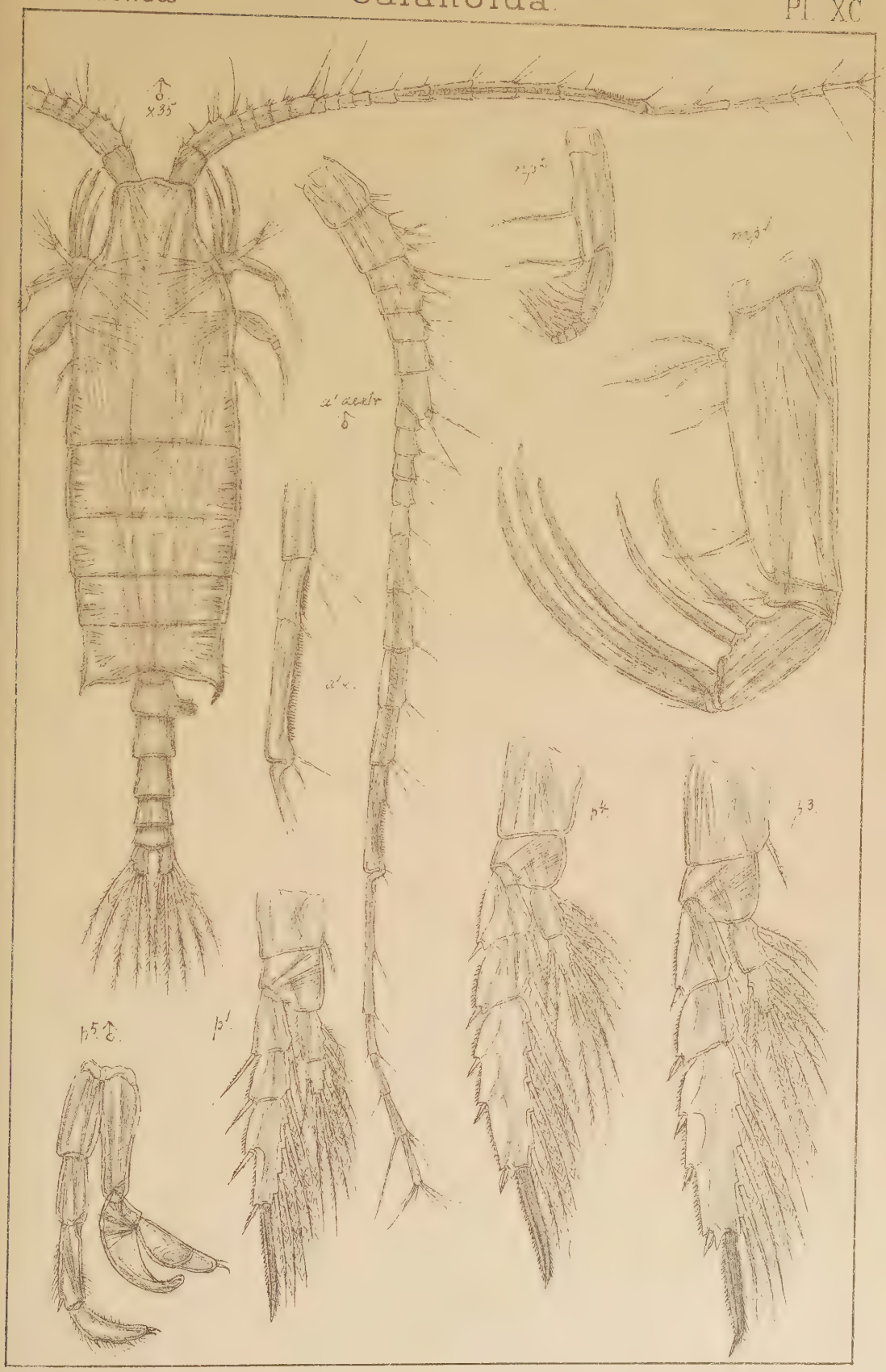
Candaciidæ — Calanoida. — Pl. LXXXIX



G O Sars autogr

Candacia norvegica, Boeck

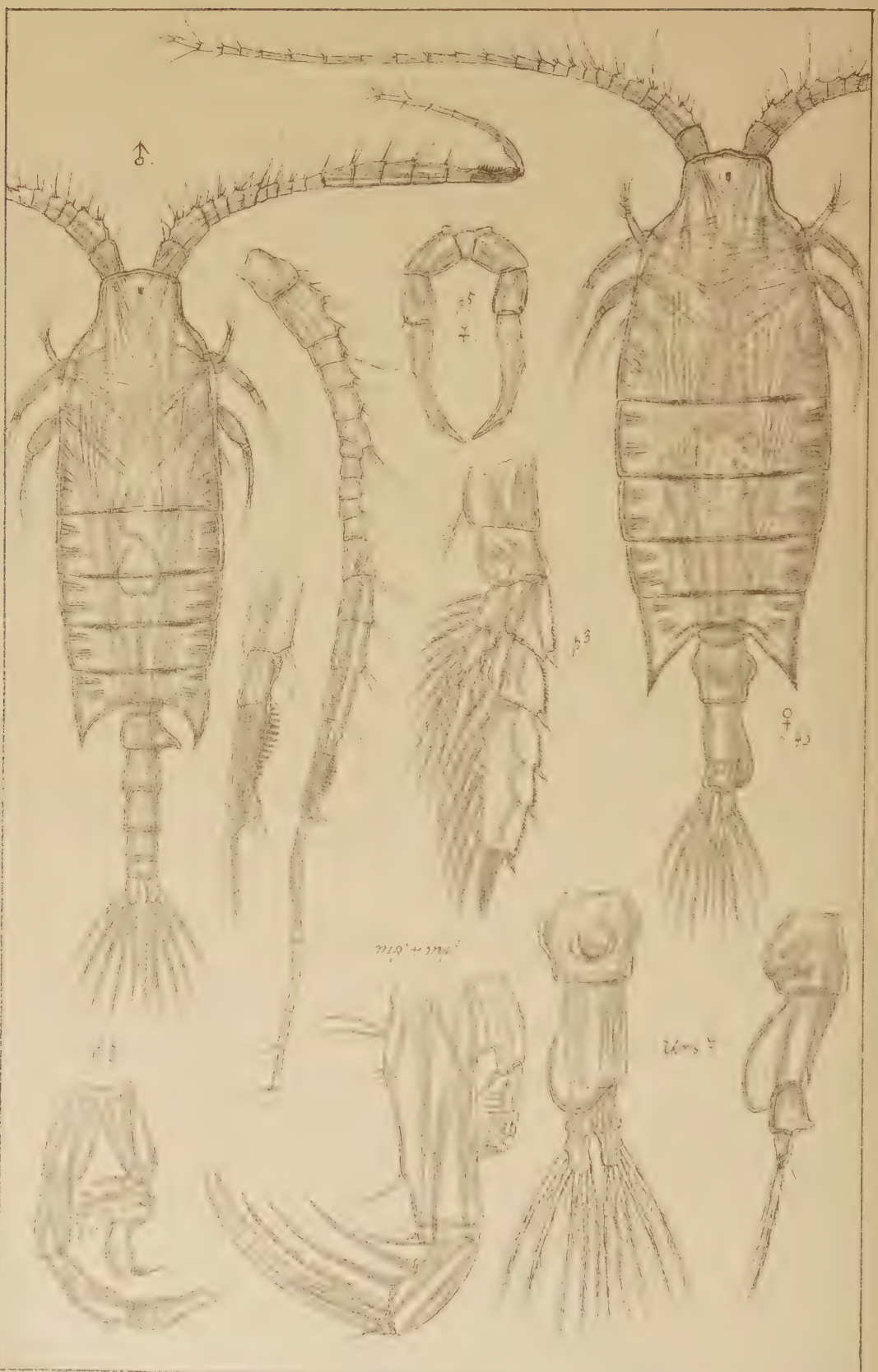
Trykt i den private Opmaaling, Chra



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

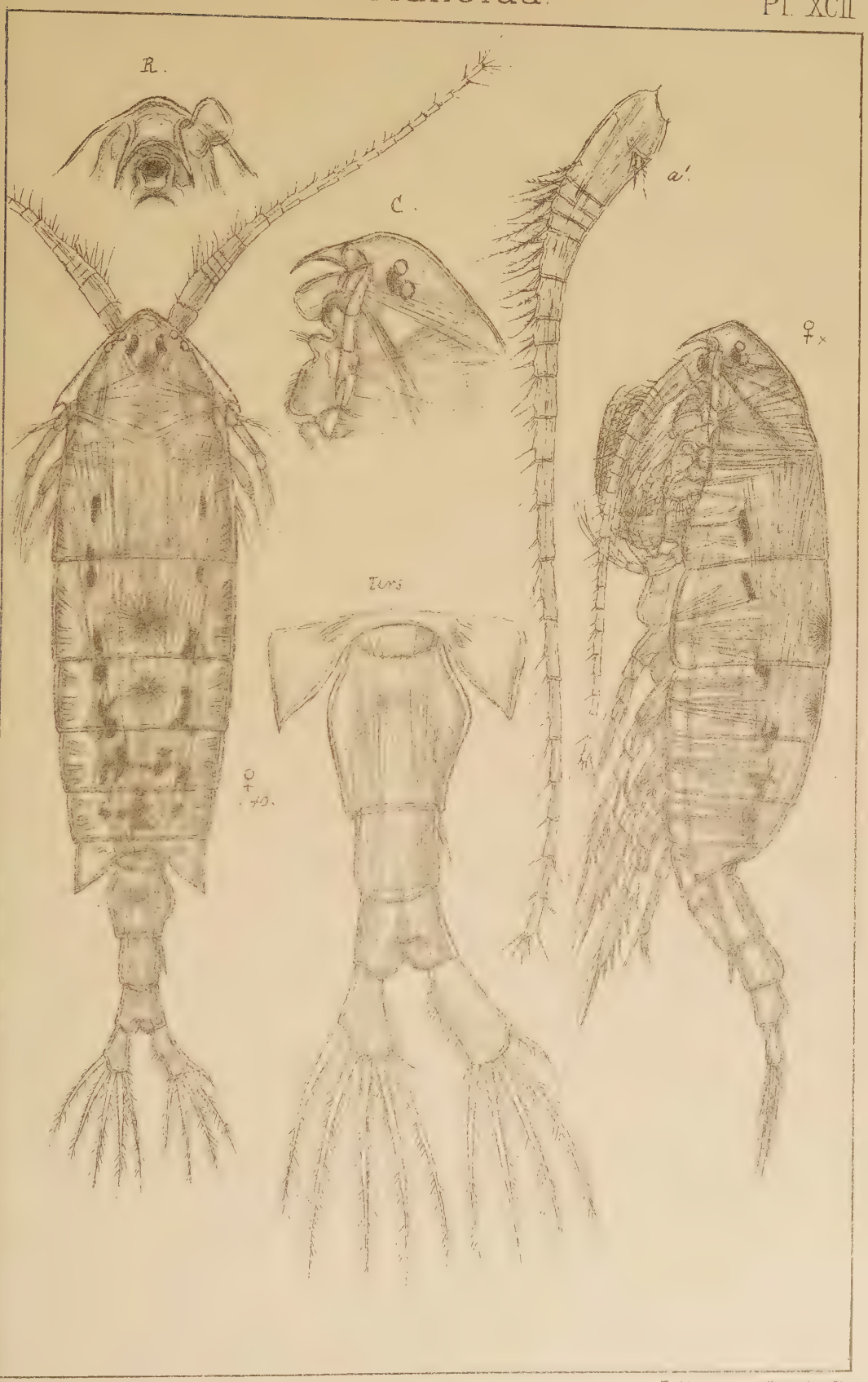
Candacia norvegica, Boeck
(continued)



G.O Sars autogr

Trykt i den private Opmaaling, Chra

Candacia armata, Boeck

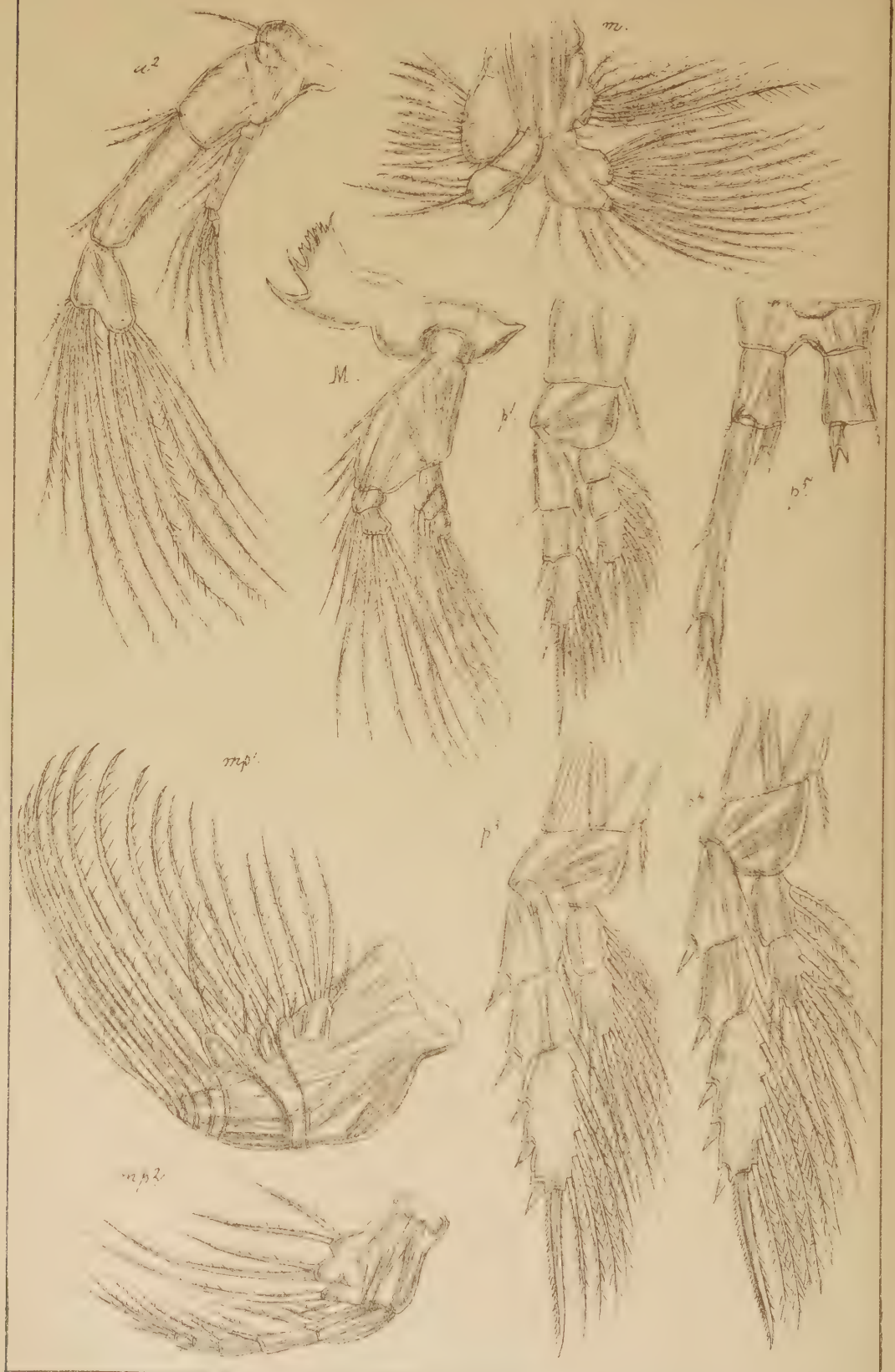


G.O. Sars autogr. Trykt i den private Opmaaling, Chra

Anomalocera Patersoni, Templt.

Copepoda

Calanoida.



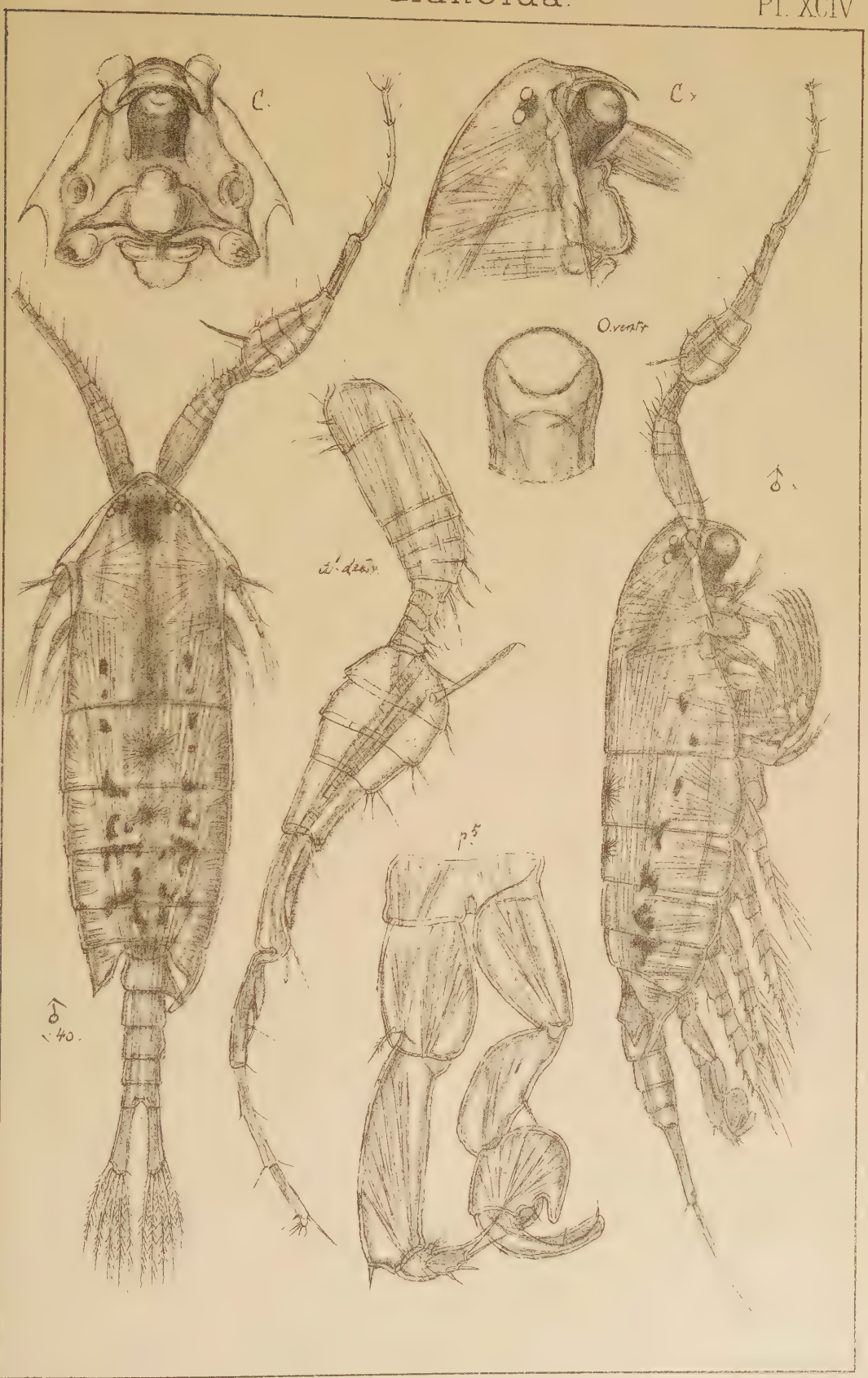
G.O Sars autogr

Trykt i den private Opmaaling, Chra

Anomalocera Pattersoni, Templt.

(continued)

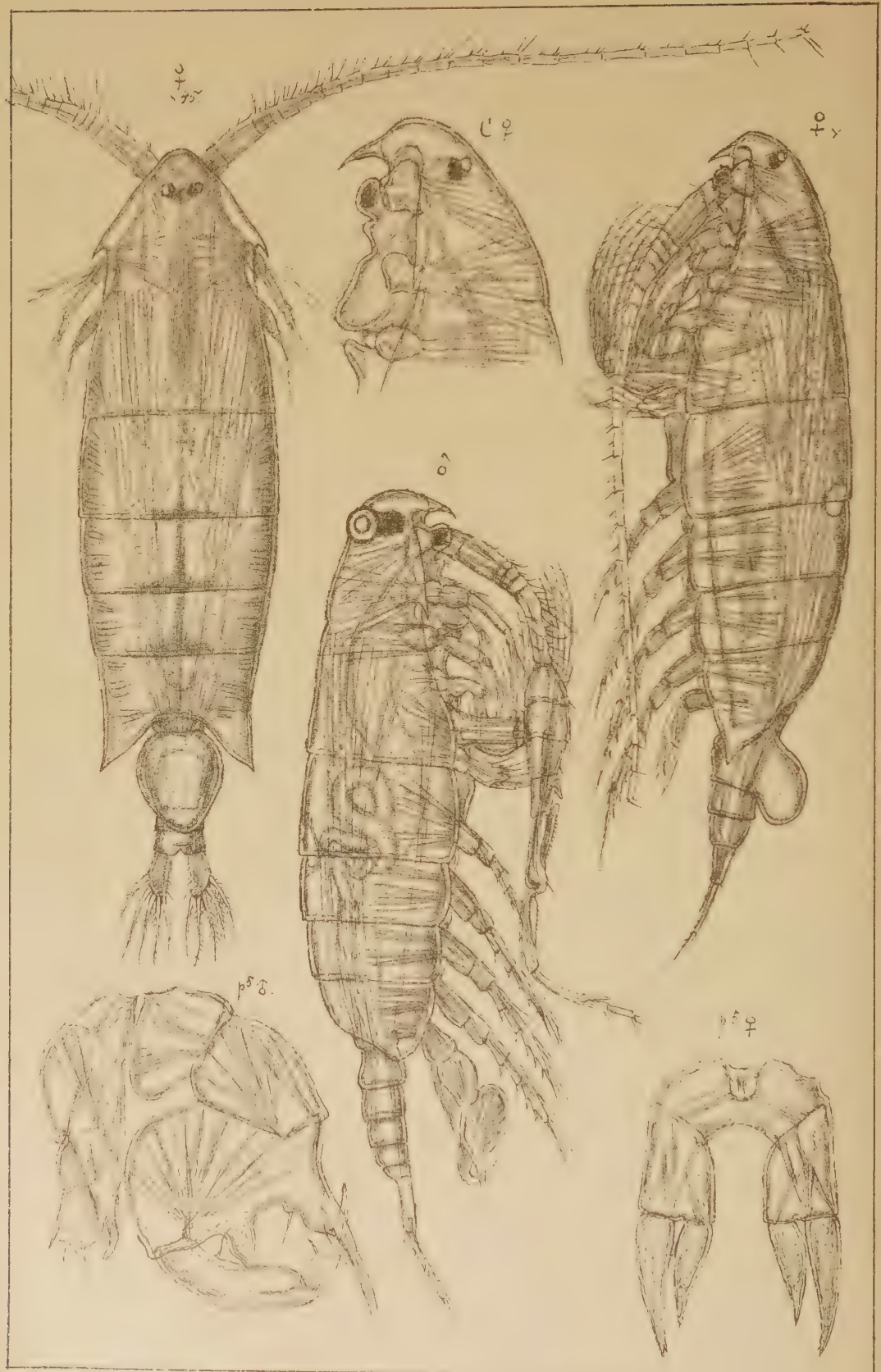
Copepoda
Calanoida.



G O Sars autogr

Trykt i den private Opmaaling, Chra

Anomalocera Pattersoni, Templt.
(male)

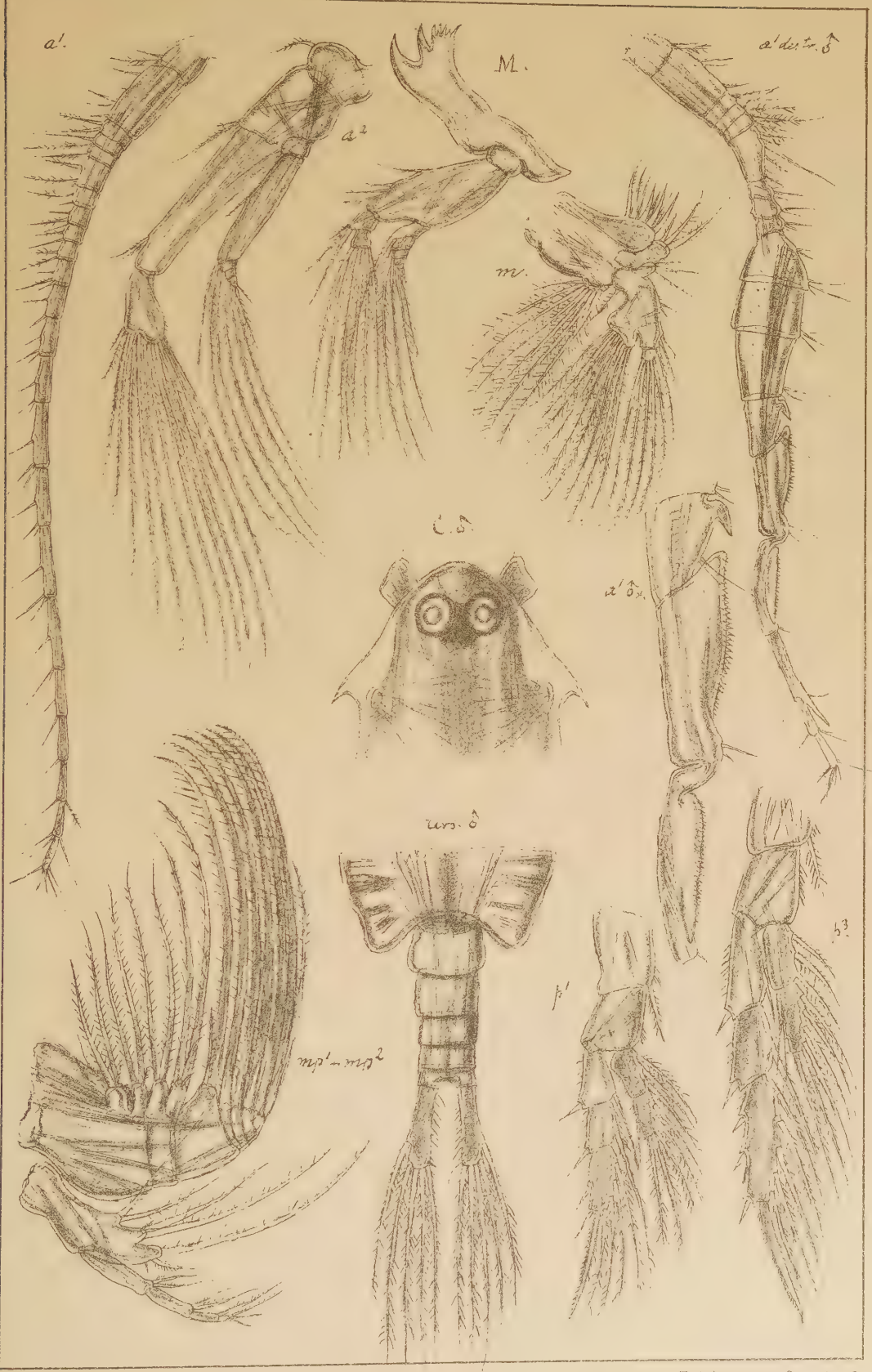


G O Sars autogr

Trykt i den private Opmaaling, Chra

Labidocera Wollastoni (Lubbock)

Copepoda
Calanoida.



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

Labidocera Wollastoni (Lubbock)
(continued)

appearance, the basal part being very slender, almost cylindric in form, inner ramus abruptly reflexed, outer quite rudimentary and occurring at rather a long distance from the inner. Maxillæ with the palp much produced, vibratory plate rudimentary. Anterior maxillipeds with strong, claw-like spines on the distal part, proximal lobes very small. Posterior maxillipeds with the 1st basal joint considerably produced in front, and carrying strongly developed setæ, distal part very small, with the setæ rudimentary. Inner ramus of 1st pair of legs 3-articulate, that of the 3 succeeding pairs biarticulate. Last pair of legs in female with both rami uniarticulate, outer slender and linear, inner short, conical; those in male 3-articulate, terminal joint in both legs spatulate, though of somewhat different form.

Remarks.—This genus was established in the year 1878 by Prof. Brady, to include a form previously described by Lubbock as a species of the genus *Pontellina* of Dana. The removal of this form, not only from that genus, but also from the family *Pontellidæ*, is justified by a number of well-marked differences, which have been mentioned in the preceding pages. The genus comprises at present only a single species, to be described below.

61. Parapontella brevicornis (Lubbock).

(Pl. XCVII & XCVIII).

Pontellina brevicornis, Lubbock, in Ann. Nat. Hist., 2nd series, Vol. XX, p. 407, Pl. XI, figs. 4—8.

Specific Characters.—Female. Anterior division of body, seen dorsally, oval in form, greatest width slightly exceeding half the length, and occurring in the middle, anterior extremity somewhat contracted and narrowly rounded at the tip, posterior but slightly attenuated. Cephalosome about the length of the 3 succeeding segments combined, and evenly vaulted above. Lateral lobes of last segment of metasome somewhat deflexed and narrowly rounded at the tip. Urosome scarcely attaining half the length of the anterior division, genital segment slightly tumefied in its proximal part and rather protuberant below, 2nd segment armed at the posterior edge with 2 sub-dorsal, posteriorly-pointing spines. Caudal rami about 3 times as long as they are broad, sublinear in form, and scarcely divergent, marginal setæ of moderate length, the outermost issuing from the outer edge, at some distance from the others. Anterior antennæ much shorter than the anterior division of the body, reaching, when reflexed, to about the end of the 2nd pedigerous segment, proximal part somewhat tumefied and clothed inside with a number of partly plumose setæ, apical bristles likewise ciliated.

Posterior antennæ with the outer ramus considerably longer than the inner, and composed of 5 joints only, last joint rather narrow, with only 2 apical setæ. Last pair of legs with the outer ramus very narrow and slightly curved, being produced at the end inside to a spiniform projection, tip armed with a slender spine, outer edge with 2 much smaller spines, the distal one placed near the tip; inner ramus about half the length of the outer, and produced at the tip to 2 short digitiform projections.

Male much more slender than female, with the right corner of last segment of metasome remarkably expanded and conically produced behind. Urosome very slender and somewhat asymmetrical, being generally turned out of the axis of the body to the left, 3rd and 4th segments each produced on right side to a small dentiform process. Right anterior antenna longer than left and much more strongly built, middle section moderately tumefied in its proximal part, its penultimate joint produced at the end anteriorly to a short dentiform projection, last joint with a serrated lamella in front; terminal section exserted at the tip to a strong mucroniform projection, at the base of which, posteriorly, issue the apical bristles. Last pair of legs rather asymmetrical, the right one being the larger, with the 1st joint considerably dilated, and produced inside to a narrow digitiform process; 2nd joint of both legs with a short dentiform projection inside; terminal joint of right leg somewhat lozenge-shaped, being suddenly dilated near the base, and exserted at the end to a slender acuminate lappet pointing straight downwards, that of left leg broadly oval in outline and partly ciliated on the edges, apical lappet quite short and pointing inwards, outer edge with 2 dentiform projections.

Colour. Body of female generally pellucid, with a faint yellowish tinge, and exhibiting dorsally at the end of each of the pedigerous segments an interrupted transverse band of a dark reddish hue; in some cases, however, rather deeply tinged with a reddish brown pigment, both on the anterior and posterior divisions. Body of male always of a uniform yellowish hue.

Length of adult female 1.55 mm., of male 1.35 mm.

Remarks.—This form was described by Lubbock as early as the year 1857, and was at that time referred to the genus *Pontellina* of Dana, apparently owing to a slight resemblance in the general form of the body. It is, however, in reality very different from that genus, and is also easily recognizable from any of the other known Calanoida.

Occurrence.—I have met with this Calanoid occasionally in 3 different localities of the west coast of Norway, viz., Molde, Christiansund and Kalvaag. In all these localities it occurred close to the shore, at a depth of a few fathoms,

among algæ. On the other hand, I have never met with it in any of the numerous plankton-samples examined by me, for which reason I have come to the conclusion that, at any rate off the Norwegian coast, this Calanoid is a strictly littoral form. It moves in the usual manner, now proceeding rather slowly in a somewhat jumping manner by rhythmical strokes of the posterior antennæ and mandibular palps, now starting away more suddenly by employing the natatory legs and the urosome.

Distribution.—British Isles (Brady), coast of France (Canu), Mediterranean (Giesbrecht), Atlantic Ocean between 50° and 59° N. Lat. (Giesbrecht).

Fam. 23. Acartiidæ.

Characters.—Body more or less slender, with the anterior division but slightly vaulted. Cephalosome well defined from the 1st pedigerous segment; front without any rostrum. Last 2 segments of metasome united. Urosome consisting in female of 3, in male of 5 segments. Caudal rami with the full number of setæ. A single eye present. Anterior antennæ very slightly attenuated and of a peculiar nodular appearance, the articulations being rather irregular and sometimes indistinctly defined, bristles very unequal; right antenna in male slightly transformed, and imperfectly geniculate. Posterior antennæ very delicate, with the inner ramus very slender, outer poorly developed. Oral parts conspicuously differing from those in other Calanoids; posterior maxillipeds, however, built upon a somewhat similar type to that in the *Pontellidæ*. The 4 anterior pairs of legs very slender and delicate, with unusually long natatory setæ; inner ramus in all these pairs biarticulate. Last pair of legs not natatory, uniramous in both sexes, very small in female, somewhat larger and subprehensile in male. No ovisac present in female.

Remarks.— This family is established to include the genus *Acartia* of Dana, which in several respects differs materially from the other known Calanoida, representing quite a particular type. It is only in the structure of the maxillipeds that some agreement is found to the *Pontellidæ*, to which family this genus has often been referred; but otherwise it is widely different. In addition to the typical genus, another nearly-allied genus has recently been established by Th. Scott as *Paracartia*. Only the former genus is represented in the northern seas.

Gen. 29. **Acartia**, Dana, 1846.

Syn: *Dias*, Lilljeborg.

Generic Characters.—Form of body slender and elegant. Cephalosome attenuated anteriorly, with the front unarmed, or in some cases carrying 2 delicate tentacular filaments below. First segment of metasome much larger than the others; lateral parts of last segment generally rounded. Urosome of moderate size, genital segment in female comparatively large, penultimate segment in male very short, and imperfectly defined from the last one. Caudal rami of different form in the different species, and, as a rule, shorter in male than in female; appendicular bristle well developed and finely plumose, arising with a bulbous base from the dorsal face of the rami. Eye comparatively large and placed close to the front. Anterior antennæ in female consisting of 17 or 18 articulations, some of the bristles rather elongated and partly plumous; those in male with some of the articulations confluent, middle section of right antenna very slightly tumefied, terminal section consisting of 3 articulations. Posterior antennæ with the junction of the inner ramus with the basal part imperfectly defined, and having the distal joint unusually prolonged, outer ramus consisting of 3 joints only, the outer 2 very small. Anterior lip trilobate, with the middle lobe very prominent. Mandibles not very strong, outermost cutting tooth larger than the others and claw-shaped, palp with the inner ramus imperfectly separated from the basal part and, like the outer, carrying very long and slender setæ. Maxillæ with a single appendicular lobe, inner ramus of palp replaced by a plumose seta, outer ramus large and reflexed, with very long setæ. Anterior maxillipeds short and stout, with long curved spines anteriorly, digitiform lobes well developed. Posterior maxillipeds resembling those in the *Pontellidæ*. Natatory legs without any plumose seta inside the 1st basal joint, 2nd basal joint of 4th pair carrying a slender deflexed seta at the outer corner; outer ramus in this and the 2 preceding pairs without distinctly defined spines outside, each of the joints being only produced at the end to a short dentiform projection, apical spine very slender, sword-shaped, with the outer edge closely serrate. Last pair of legs in female 3-articulate, 2nd joint somewhat dilated and carrying a long plumose seta outside, terminal joint gradually exserted to a slender point, which in some cases is spiniform, in others setiform; those in male 4-articulate and somewhat asymmetrical, right leg the larger, with some of the joints lamellarly expanded inside, terminal one securiform or slightly hooked; left leg with the terminal joint somewhat spoon-shaped.

Remarks.—This genus was established by Dana as early as the year 1846, to comprise some species chiefly from the Pacific Ocean. The genus *Dias* of Prof. Lilljeborg is unquestionably identical with Dana's genus. It is easily recognizable by the slender, pellucid body, and the very delicate and peculiar structure of the several appendages. We know at present of a considerable number of species from different tracts of the oceans, amounting to about 20 in all. Some of them, however, may probably be referable to the nearly-related genus *Paracartia* of Scott. To the fauna of Norway belong 3 species, to be described below. A 4th species, *A. bifilosa* Giesbrecht, will also in all probability be found to occur off the Norwegian coast, as it has been observed both in the Baltic and off the British coast.

62. Acartia longiremis (Lilljeborg).

(Pl. XCIX & C).

Dias longiremis, Lilljeborg, De Crustaceis ex ordinibus tribus in Scania occurrentibus, p. 181, Pl. XXIV.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong fusiform in outline, greatest width about equalling $^1/_3$ of the length, anterior extremity somewhat contracted and obtusely truncated at the tip, posterior gradually attenuated. Cephalosome attaining nearly half the length of the anterior division, front without any trace of tentacular filaments below. Lateral lobes of last segment of metasome rounded off at the tip, and each carrying dorsally a rather conspicuous, delicate spinule. Urosome about equal in length to $^1/_3$ of the anterior division, genital segment fully as long as the other 2 combined, and, like them, clothed both laterally and at the posterior edge with scattered, very delicate spinules. Caudal rami sublinear in form, their length considerably exceeding that of the anal segment, and slightly asymmetrical, right ramus projecting somewhat beyond the left, and having the appendicular bristle nearer to the tip; marginal setæ densely plumose and somewhat divergent. Anterior antennæ, when reflexed, reaching about to the middle of the genital segment, none of the articulations dentiferous. Length of apical spine of outer ramus in 2nd to 4th pairs of legs considerably exceeding that of the whole ramus. Last pair of legs with the terminal joint exserted to a slender setiform point, and somewhat curved in the middle.

Male considerably smaller than female and easily recognizable by the structure of the anterior antennæ and urosome. Caudal rami comparatively shorter than in female, otherwise of a very similar appearance. Last pair of legs of moderate size, 2nd and 3rd joints of right leg each expanded inside in to a rounded

lamellar projection, terminal joint of same leg securiform, that of left leg comparatively broad.

Colour. Body in both sexes highly pellucid, with a very faint tinge of blue. Length of adult female reaching to 1.25 mm., of male to 1.05 mm.

Remarks.—This form was first described by Prof. Lilljeborg in his well-known treatise on the Entomostraca of Skåne under the name of *Dias longiremis*. It is not easy at once to distinguish this form from some of the other species, to which it bears a great similarity. On a closer examination, however, it may be readily recognized in both sexes by the slender and delicate spinule occurring on the dorsal face of the lateral lobes of the last segment of the metasome, as also by the relative length of the anterior antennæ and caudal rami. Moreover the apical spine of the outer ramus in the 2nd to 4th pairs of legs is more elongated than in most other species, and the difference in the last pair of legs in the female is very distinctly marked by the slenderness of the terminal joint, which is exserted to a very thin, flexible point, whereas in most other species this joint is pronouncedly spiniform.

Occurrence.—This Calanoid is distributed along the whole Norwegian coast, from the Christiania Fjord to Vadsø, sometimes occurring in great numbers. It is a true pelagic form, being often met with far out at sea, and at the very surface. Not unfrequently, however, it is brought by the current close to shore; and it is even often found in tidal pools together with *Paracalanus parvus* and *Temora longicornis*. It moves with great rapidity in abrupt bounds.

Distribution.—British Isles (Brady), Kattegat (Lilljeborg), the Baltic (Giesbrecht), Gulf of Finland (Nordqvist), Färoes Isles (Cleve), Iceland and southern Greenland (idem), Spitsbergen, polar basin, north of the New Siberian Islands (the present author).

63. Acartia Clausi, Giesbrecht.

(Pl. CI).

Acartia Clausii, Giesbrecht, Fauna & Flora des Golfes von Neapel. Pelagische Copepoden, p. 507, Pl. 30. figs. 2, 4, 13—15, 17, 28, 36, 47; Pl. 42, fig. 32; Pl. 43, figs. 3, 5, 14.

Syn: *Dias longiremis*, Claus (not Lilljeborg).

Specific Characters.—Female. Very like the preceding species both in size and general appearance, and, like the latter, without any trace of tentacular appendages in front. Lateral lobes of last segment of metasome, however, without the dorsal spinule found in *A. longiremis*, but having the edge armed with from 4 to 6 extremely small and closely set denticles. Urosome with the first 2

segments clothed at the end dorsally with a transverse row of still smaller denticles, but having no lateral spinules. Caudal rami comparatively shorter than in *A. longiremis*. Anterior antennæ likewise somewhat shorter, scarcely exceeding the length of the anterior division of the body, 5th articulation with a distinct denticle in front. Length of apical spine of outer ramus in 2nd to 4th pairs of legs scarcely exceeding that of the ramus. Last pair of legs with the terminal joint produced to a strong claw-like spine minutely spinulose outside.

Male resembling that of the preceding species, but having the caudal rami comparatively shorter, and nearly as broad as they are long. Last pair of legs very like those in the male of *A. longiremis*, though having the terminal joint of right leg considerably narrower and that of left leg less expanded.

Colour.—Body in both sexes extremely pellucid and nearly colourless.

Length of adult female 1.15 mm., of male 1.00 mm.

Remarks.—This form is so very like the preceding species that, without a close examination, it may readily be confounded with it. This has also actually been done by Claus, who described it as *Dias longiremis* Lilljeborg; and Brady also seems to have confounded the 2 species. Dr. Giesbrecht, however, has pointed out some minute differences between them, and as these differences are fairly constant, they seem to justify the specific distinction of the two forms. The most conspicuous distinctive characters are the different armature of the lateral lobes of the last segment of the metasome and of the urosome, as also the comparatively shorter anterior antennæ and caudal rami in the present species. The last pair of legs in the female, moreover, conspicuously differ from those in *A. longiremis* in the form of the terminal joint; and these legs in the male also exhibit some slight differences, as shown by the figures here given.

Occurrence.—Off the south and west coasts of Norway this form is fully as common as *A. longiremis*, in company with which species it is often found. On the other hand, I have never met with it in any of the samples of plankton from the Arctic Ocean. It accordingly seems to be a more southern form than *A. longiremis*, and this assumption is also confirmed by what is at present known of its foreign distribution.

Distribution.—British Isles (Scott), Färoe Isles (Cleve), Heligoland (Claus), coast of France (Canu), Mediterranean (Giesbrecht), Black Sea (Karawajew), Azores (Cleve), Atlantic Ocean between 36° and 61° N. Lat. (Giesbrecht); Gulf of Guinea (Scott).

64. Acartia discaudata, Giesbrecht.

(Pl. CII).

Dias discaudatus, Giesbrecht, Die freilebenden Copepoden der Kieler Föhrde. 7te Bericht. d. Commiss. Unters. Deutsch. Meere, p. 148, Pl. III, figs. 4, 22, 23; Pl. V, fig. 18; Pl. VI, fig. 17; Pl. VIII, figs. 32, 33; Pl. IX, fig. 30.

Specific Characters.—Female. Anterior division of body of a form similar to that in the 2 preceding species. Front without any tentacular filaments. Lateral lobes of last segment of metasome rounded off and quite smooth. Urosome likewise without any traces of spinules or denticles, and rather robust, genital segment very large, conspicuously dilated in its proximal part, and very protuberant below in the middle; 2nd segment terminating dorsally in a rounded protuberance; 3rd segment flattened and considerably expanded distally. Caudal rami of rather an unusual appearance, being bulbously dilated, and rounded oval in form, with the marginal setæ comparatively short and conspicuously dilated at the base. Anterior antennæ about the length of the anterior division of the body, and without any denticles in front. Last pair of legs resembling those in *A. Clausi*, the terminal joint being spiniform, though somewhat less strong than in that species.

Male resembling that of the 2 preceding species, though perhaps less slender. Urosome of normal appearance, the caudal rami not, as in the female, bulbously dilated, but of a similar form to that in the male of *A. Clausi*. Last pair of legs considerably larger than in either of the 2 preceding species, right leg much elongated, being more than twice as long as the left, with the lamellar expansions inside the 3 first joints comparatively small, terminal joint rather narrow, almost claw-like.

Colour.—Body of female semipellucid, with a distinct bluish grey hue; that of male paler.

Length of adult female 1.20 mm., of male 1.10 mm.

Remarks.—This form may at once be distinguished from the other known species, at any rate in the female sex, by the peculiar structure of the urosome, but more especially by the greatly dilated caudal rami. The male differs less conspicuously, though the last pair of legs exhibit well marked peculiarities. Another distinguishing character not mentioned in the above diagnosis, is the large size and peculiar sac-like form of the spermatophore often found attached to the genital segment of the female.

Occurrence.—I have hithertho only met with this form in 2 localities of the Norwegian coast, viz., Bratholmen and Skjerjehavn, the former situated at some distance south of Bergen, the latter at the mouth of the Sogne Fjord. In both these localities it occurred occasionally close to the shore, together with *A. longiremis,* from which it was at once distinguished by its darker blue colour.

Distribution.—The Baltic (Giesbrecht), Scottish coast (Scott), coast of France (Canu).

SUPPLEMENT.

Page 15. Rhincalanus nasutus, Giesbr.

Remarks.—The form recorded by Th. Scott as *R. gigas*, Brady, is unquestionably the present species.

Distribution.—Scottish coast (Scott).

Page 18. Paracalanus parvus (Claus).

Distribution.—Black Sea (Karawajew), Gulf of Guinea (Scott).

Page 21. Pseudocalanus elongatus, Boeck.

Distribution.—Black Sea (Karawajew).

Page 21. The following species should be added:

Pseudocalanus gracilis, G. O. Sars.

(Suppl. Pl. I).

Specific Characters.—Female. Body of still more slender form than in the typical species, with the anterior division, seen dorsally, narrow oblong in form, greatest width scarcely attaining $^1/_3$ of the length; frontal part conspicuously projecting, and, seen laterally, almost angularly curved in the middle. Lateral parts of last segment of metasome obtusely rounded. Urosome very slender, though scarcely exceeding half the length of the anterior division. Caudal rami comparatively narrower than in *P. elongatus*, and more divergent. Anterior antennæ more elongated, reaching, when reflexed, to the end of the 3rd caudal segment. Legs considerably more slender than in the typical species, with both rami very narrow. Ovisac rather large, rounded oval in form, and somewhat flattened, containing a number of globular, highly pellucid ova.

Male resembling that of *P. elongatus*, but having the anterior antennæ considerably longer. Last pair of legs of a structure very similar to that in the male of the said species.

Colour not yet ascertained.

Length of adult female 1.65 mm., of male 1.15 mm.

Remarks.—This form, though nearly allied to the typical species, is unquestionably distinct, differing, as it does, not only in the more slender form of the body and the gibbously produced frontal part, but also in the greater length of the anterior antennæ, and the more slender form of the natatory legs.

Occurrence.—This form occurred not unfrequently in some of the plankton-samples taken during the cruise of the "Michael Sars", 1900, in the open sea between Finmark and Bear Island; but as the specimens were more or less damaged, and moreover, as shown by the structure of the urosome, had not arrived at sexual maturity, their specific difference from *P. elongatus* was less apparent, for which reason I at first only regarded this form as a variety of the typical species. It was only by the examination of another sample taken by Mr. Amundsen early in the spring of the following year from about the same tract, that I could convince myself of the distinctness of the present form. This sample contained several fully adult and admirably preserved female specimens with the rather large ovisac still attached to the genital segment, and also some few adult male specimens. In the same sample a number of comparatively large, and likewise ovigerous, specimens of *P. elongatus* also occurred, and it was very easy to distinguish between these 2 species, on account of the rather different shape of the frontal part, and the difference in the length of the anterior antennæ. That this undoubledly true arctic form also occasionally occurs in the immediate neighbourhood of the Norwegian coast, was proved by the examination of one of the plankton-samples taken during the cruise of the „Michael Sars" in the Lyngenfjord, Finmark. This sample contained some young specimens of a *Pseudocalanus* evidently belonging to the present species.

The following genus is also to be added:

Microcalanus, G. O. Sars 1901.

Syn: *Pseudocalanus*, G. O. Sars (part).

Generic Characters.—Body of comparatively small size, and rather short and compact form, recalling that of *Paracalanus*. Cephalosome completely coalesced with the 1st pedigerous segment; front carrying 2 extremely small tentacular appendages below. Urosome in female comparatively short, with the genital segment more or less dilated, in male considerably more slender. Caudal rami

small, each with 4 subequal apical setæ. Anterior antennæ more or less slender, composed in female of 24 articulations, and in male transformed in much the same manner as in *Pseudocalanus*. Posterior antennæ and oral parts resembling in structure those parts in the said genus. Posterior maxillipeds, however, more slender, and having the terminal part reflexed. Natatory legs on the whole built upon the same type as in *Pseudocalanus*. Last pair of legs in female wholly absent, in male comparatively small and very asymmetrical, left leg slender, 6-articulate, right very small, 3-articulate, last joint not styliform.

Remarks.—As I stated on page 20, it is now my opinion that the small Calanoid described from Nansen's Polar Expedition as *Pseudocalanus pygmæus* should more properly be regarded as the type of a separate genus, for which the name *Microcalanus* was proposed. The correctness of this view has now been still further confirmed by the discovery off the Norwegian coast of another still smaller Calanoid, which is evidently congeneric with the polar form, though apparently specifically distinct. This form is described below.

Microcalanus pusillus, G. O. Sars, n. sp.

(Suppl. Pl. II, & Pl. III, fig. 1).

Specific Characters.—Female. General form of body resembling that of *M. pygmæus*, the anterior division being rather tumid and, seen dorsally, of oval form, greatest width almost attaining half the length, both extremities abruptly contracted, the anterior one narrowly rounded at the tip. Cephalosome together with the united 1st pedigerous segment occupying $^2/_3$ of the anterior division, dorsal margin evenly curved in front. Lateral lobes of last segment of metasome somewhat appressed and rounded off at the tip. Urosome about equal in length to $^1/_3$ of the anterior division, genital segment conspicuously dilated in the middle. Caudal rami scarcely longer than they are broad, apical setæ of moderate length. Eye wholly absent. Anterior antennæ much shorter than in the typical species, scarcely reaching, when reflexed, beyond the genital segment. Natatory legs less slender than in *M. pygmæus*, terminal joint of outer ramus in 2nd to 4th pairs comparatively broader, with the apical spine remarkably dilated, cultellate in shape, and very coarsely serrate outside.

Male rather unlike the female in general appearance, the anterior division being still shorter and more tumid, whereas the urosome is much more slender than in female, fully equalling half the length of the anterior division. Anterior antennæ with the proximal part rather dilated and clothed anteriorly with large

curved sensory appendages, 7th joint very elongated and apparently formed by the coalescence of 5 articulations. Oral parts, as in the male of *Pseudocalanus*, much reduced. Last right leg scarcely 1/3 as long as the left, terminal joint simple, rounded.

Colour.—Body in both sexes highly pellucid and almost colourless.

Length of adult female scarcely exceeding 0.70 mm., that of male about the same.

Remarks.—This dwarf Calanoid, perhaps the smallest of all hitherto known forms, is closely allied to the polar species, *M. pygmæus*, though differing conspicuously in the much shorter anterior antennæ, as also in the structure of the natatory legs, but more especially in the peculiar development of the apical spine of the outer ramus. It may here be remarked that the male specimen figured on Pl. XXII of my Account of the Crustacea of the Norwegian North Polar Expedition, and described as the male of *Spinocalanus longicornis*, most certainly does not belong to that form, but to *Microcalanus pygmæus*, which is proved by its great similarity to the male of the present species.

Occurrence.—Owing to its small size and inconspicuous colouring, this form had previously quite escaped my attention, though in reality it seems to be rather common, at any rate off the west coast of Norway. During a 2 months' stay last summer in that part of the country, I found this Calanoid rather abundantly in 3 different places, viz., at Christiansund, Aalesund, and in the Storfjord, farther inland than the last-mentioned town. In all these places, however, it only occurred in depths of more than 150 fathoms; and it thus appears to be a true deepwater form. The same species was also found in 2 plankton-samples kindly sent to me by Mr. Nordgaard, both taken from great depths, the one in the Herlö Fjord, the other in the Oster Fjord, near Bergen. Finally, some few more or less defective specimens of a *Microcalanus* (perhaps more properly referable to the polar species) were picked out of a plankton-sample taken during the cruise of the "Michael Sars" in the open sea between Jan Mayen and Finmark.

Page 22: Spinocalanus abyssalis, Giesbrecht.

(See Pl. XII & Suppl. Pl. III, fig. 2).

Spinocalanus abyssalis, Giesbrecht, Fauna & Fl. Golfes Neapel. Pelagische Copepoden, p. 209, Pl. 13, figs. 42—48, Pl. 36, fig. 49.

Syn: *Spinocalanus longicornis*, G. O. Sars.

(For the description of the female, see p. 22).

Description of Male. General appearance very different from that of the female. Anterior division of body oblong oval in form, both extremities,

especially the posterior one, contracting abruptly. Front unarmed, as in the female. Urosome very slender and narrow, attaining almost half the length of the anterior division, 2nd segment much the largest, anal segment very small, almost obsolete. Caudal rami mobile, and generally spread to each side. Anterior antennæ very much shorter than in female, their length scarcely exceeding that of the anterior division, and clothed in their proximal part with large curved, sensory appendages. Oral parts transformed in a manner similar to that found in the male of *Paracalanus* and *Pseudocalanus*. Natatory legs exhibiting the characteristic armature mentioned by Dr. Giesbrecht, 2nd joint of outer ramus in 2nd to 4th pairs provided on the hind face with an obliquely transverse row of extremely delicate, somewhat flattened spines. Last pair of legs comparatively small and but slightly asymmetrical, both legs biramous, with the inner ramus simple styliform and longer on right side, outer ramus of right leg biarticulate, of left 3-articulate, terminal joint in both styliform.

Colour not yet ascertained. Length of the specimen examined 1.60 mm.

Remarks.—I am now of opinion that the form recorded from Nansen's Polar Expedition as *S. longicornis*, and subsequently redescribed in the present Account under the same name, is in reality identical with Giesbrecht's species. On a closer examination, I have convinced myself that the characteristic armature of the natatory legs described and figured by Dr. Giesbrecht, is also present in both sexes of the northern form. The transverse row of flattened spines occurring on the hind face of the 2nd joint of the outer ramus is of such a delicate nature, however, that it may easily escape attention, if the opposite face of the joint be turned to the observer. The male, of which only a solitary specimen has hitherto come under my notice, is so very unlike the female, that it was only by the dissection of the specimen that I could with perfect certainty refer it to the present species. The most striking difference is unquestionably the disproportionate length of the anterior antennæ, these being scarcely longer than the anterior division of the body, whereas in the female their lenght considerably exceeds that of the whole body. An analogous sexual disproportion in these antennæ has also been shown by Dr. Giesbrecht, however, in a few other Calanoids belonging to the genera *Calanus* and *Haloptilus*.

Occurrence.—The above-described male specimen was found in a plankton-sample taken by Mr. Nordgaard in the Oster Fjord from a depth of from 400 to 600 metres, and kindly sent to me for examination. In the same sample a few female specimens also occurred.

Distribution.—Pacific Ocean, between Lat. 14° N. and 4° S., at a depth of 1000—4000 metres (Giesbrecht); polar basin crossed by Nansen, at 2 different Stations.

Page 25. Ætideus armatus, Boeck.

Remarks.—I have recently had an opportunity, through the kindness of Prof. Brady, of examining 2 of the Challenger specimens, from which the original description of his *Ætideus armatus* was made, and cannot find any difference whatever between them and the northern form. For this reason I must consider Brady's and Boeck's species as identical, in spite of the widely-separated localities.

Occurrence.—I found this form last summer not unfrequently at Aalesund and in the Storfjord, in depths ranging from 30 to 150 fathoms.

Distribution.—Off the Shetland Islands (Scott), Färoe Channel (Norman's Collection), Indian Ocean, Torres Strait, Chinese Sea, South Atlantic Ocean (Brady), Gulf of Guinea (Scott).

Page 26. The following new genus is to be added:

Ætideopsis, G. O. Sars.

Generic Characters.—External appearance somewhat resembling that of *Ætideus*, the front being produced below to a strong bifurcate rostrum. Last segment of metasome, however, well defined from the preceding one, and having the lateral corners acutely produced. Urosome of moderate size, with the caudal rami comparatively short; outermost seta rudimentary, appendicular bristle very small. Anterior antennæ slender and attenuated, consisting (in female) of 24 well-defined articulations. Posterior antennæ and oral parts nearly agreeing in their structure with those in *Chiridius*, the posterior maxillipeds exhibiting a similar slender form. Legs likewise built upon the same type as in that genus.

Remarks.—This new genus is somewhat intermediate in character between *Ætideus* and *Chiridius*, agreeing with the former in the strongly developed, bifurcate rostrum, while the structure of the caudal rami and of the several appendages resembles more that of *Chiridius*. The present genus differs from both these genera in the fact that the last segment of the metasome is well defined from the preceding one. The genus comprises as yet only a single species, described below.

Ætideopsis rostrata, G. O. Sars, n. sp.

(Suppl. Pl. IV & V).

Specific Characters.—Female. Body moderately slender, with the integuments of an unusually firm consistency. Anterior division, seen dorsally, oblong oval in form, greatest width slightly exceeding $^1/_3$ of the length, anterior extremity conspicuously dilated in the oral region, and abruptly contracted in front, tip triangularly produced, posterior extremity gradually attenuated. Cephalosome separated above from the 1st pedigerous segment by a well-marked transverse groove, dorsal face only slightly vaulted, lateral edges conspicuously insinuated in the middle. Rostrum highly chitinized and pointing straight downwards, lateral spikes acutely pointed and somewhat divergent. Last segment of metasome very short, but defined in front by a well-marked curved suture, lateral corners produced to strong mucroniform processes pointing straight backwards and extending beyond the middle of the genital segment. Length of urosome scarcely exceeding $^1/_3$ that of the anterior division, genital segment not very large, and but slightly protuberant below. Caudal rami about the length of the anal segment, and somewhat flattened, tip obliquely rounded. Eye apparently well developed. Anterior antennæ, when reflexed, reaching about to the end of the 2nd caudal segment. Posterior antennæ with the outer ramus somewhat longer than the inner. Posterior maxillipeds almost exactly as in *Chiridius*, the 2nd basal joint being very narrow and elongated, whereas the terminal part is comparatively short, scarcely half as long as this joint. Apical spine of outer ramus in 2nd to 4th pairs of legs very strong, its outer edge densely aculeate in a pectinate manner.

Male unknown.

Colour not yet ascertained.

Length of adult female 4.40 mm.

Remarks.—This form, as stated above, somewhat recalls *Ætideus armatus* by the strongly-developed, bifurcate rostrum and the acutely produced lateral corners of the last segment of the metasome. It may, however, be at once distinguished by the far less vaulted cephalosome, and the sharply marked boundary between the last 2 segments of the metasome. It is also of considerably larger size.

Occurrence.—Two female specimens of this form were found in a plankton-sample taken, during the cruise of the "Michael Sars" in 1900, at Stat. 34, situated between Jan Mayen and Finmark, the depth being recorded to be from 500 to 1000 metres.

Page 28. Chiridius armatus (Boeck).

Occurrence.—A solitary male specimen, unquestionably belonging to this species, was found in a plankton-sample taken during the cruise of the "Michael Sars", at Stat. 10, east of Iceland, depth 250—400 metres.

Page 30. The following genus should be added:

Gaïdius, Giesbrecht, 1895.

Syn: *Chiridius*, G. O. Sars (part).

Generic Characters.—Body comparatively more robust than in *Chiridius*, with the urosome shorter in proportion to the anterior division. Front produced below to a very small, undivided rostral projection. Last segment of metasome wholly coalesced with the preceding one, lateral lobes obtusely rounded and each exhibiting, somewhat outside the tip, a narrow spiniform process pointing backwards. Caudal rami short, resembling in structure those in *Chiridius*. Anterior antennæ in both sexes very slender, in female 24-articulate, in male with some of the articulations coalesced. Posterior antennæ with the inner ramus somewhat longer and narrower than in *Chiridius*. Oral parts almost exactly as in that genus. Legs likewise of a very similar structure, except that in the outer ramus of 1st pair, the spine outside the 1st joint is missing.

Remarks.—Although the differences between this genus and *Chiridius* appear to be very slight, it may perhaps be advisable to retain the genus, since there are 2 northern species that so closely agree with that first described by Dr. Giesbrecht, that the 3 species together form a natural group. The typical species is *G. pungens* Giesbr. from the Pacific Ocean; the other 2 species have been described by the present author from Nansen's Polar Expedition as *Chiridius tenuispinus* and *C. brevispinus*. Both these arctic species subsequently proved to be referable to the Norwegian fauna. The female of the first-named species has already been described in the present Account, and it only remains here to describe the hitherto unknown male of this form. The 2nd species is now for the first time added to the Norwegian fauna.

Gaïdius tenuispinus, G. O. Sars.

(See Pl. XVIII & Suppl. Pl. VI, fig. 1).

Chiridius tenuispinus, G. O. Sars, Crustacea of the Norw. North Polar Expedition, p. 67, Pl. XVIII. (For the description of the female, see p. 30).

Description of the Male.—Anterior division of body, seen dorsally, oval in form, somewhat attenuated anteriorly, with the greatest width occurring considerably behind the middle. Lateral processes of last segment of metasome well marked, and of the same appearance as in the female. Urosome, as usual, much narrower, and composed of 5 segments, the last of which, however, is very small, almost obsolete. Anterior antennæ of about the same relative length as in female, but transformed in the usual manner, their proximal part being rather dilated, and clothed in front with large curved sensory appendages, terminal part very slender, and forming with the proximal one a somewhat angular curve. First pair of legs with the 1st joint of the outer ramus distinctly separated from the 2nd. Last pair of legs comparatively large, and somewhat resembling in structure those in the male of *Chiridius armatus,* both legs provided with a rudimentary inner ramus, that of right leg pronouncedly club-shaped, that of left much narrower; outer ramus of right leg biarticulate, with the proximal joint rather large and curved, distal joint very narrow, and forming a small rounded lobule inside, beyond the middle: that of left leg 3-articulate, last joint spiniform.

Length of the specimen examined about 2 mm.

Remarks.—It will be seen from the above short description, that the sexual differences in the present form do not materially differ from those found in the genus *Chiridius,* and the last pair of legs in the male even bears a very close resemblance to those in the male of *Chiridius armatus.*

Occurrence.—The above-described specimen was found in the same sample (Stat. 34) in which *Ætideopsis armata* occurred, and could at once be recognized as the male of the present species by the slender spiniform processes issuing from the last segment of the metasome.

Gaïdius brevispinus, G. O. Sars.

(Suppl. Pl. VI, fig. 2).

Chiridius brevispinus, G. O. Sars, Crustacea of the Norw. North Polar Expedition, p. 68, Pl. XIX.

Specific Characters.—Female. Body comparatively robust, with the anterior division rather massive and, seen dorsally, oblong oval in form; anterior extremity somewhat contracted near the tip, which appears obtusely truncated, posterior

extremity only slightly attenuated. Rostral prominence exactly as in *G. tenuispinus*, forming a very small conical projection. Lateral lobes of last segment of metasome broadly rounded, spiniform process outside the tip extremely small. Urosome scarcely attaining $^1/_3$ of the length of the anterior division; caudal rami comparatively very short and somewhat divergent. Anterior antennæ slender and elongated, reaching, when reflexed, as far as the tip of the caudal rami. Posterior antennæ and oral parts almost exactly as in *G. tenuispinus*. First pair of legs with the 1st joint of the outer ramus well defined, though, as in *G. tenuispinus*, without any trace of a spine outside; inner ramus of 2nd pair distinctly biarticulate.

Male unknown.

Colour not yet ascertained.

Length of adult female 4.80 mm.

Remarks.—This form is undoubtedly very closely allied to *G. tenuispinus*, though easily distinguishable by its much larger size and somewhat more robust form of body, the more elongated anterior antennæ, and the small size of the spiniform processes issuing from the last segment of the metasome.

Occurrence.—A solitary but well-preserved female specimen of this Arctic form was found in the same sample (Stat. 34), in which the male of *G. tenuispinus* occurred.

Distribution.—Polar basin crossed by Nansen, at 6 different Stations (the present author); Färoe Channel (Norman's Collection).

Page 32. Undinopsis Bradyi, G. O. Sars.

Remarks.—During the past summer I have found this form very plentiful in one place near Aalesund, just at the bottom of a steep incline, on a sandy bottom. Male specimens were by no means rare, and on a renewed examination of the latter, I found that the right last leg is generally wholly absent. In some few specimens from the same locality, otherwise indistinguishable from the others, these legs, however, exhibited exactly the appearance figured on Pl. XIX, a distinct rudiment of the right leg being present.

Page 39. Euchæta norvegica, Boeck.

Distribution.—Scottish coast (Scott).

Page 42. Euchæta barbata, Brady.

Distribution.—Gulf of Guinea (Scott).

Page 47. Xanthocalanus borealis, G. O. Sars.

Distribution.—East of the Shetland Islands (Scott).

Page 53. Amallophora brevicornis, G. O. Sars.

Remarks.—The hitherto unknown male of this species has recently been described by Th. Scott, and the correctness of my opinion in considering this form to be a true *Amallophora*, is fully confirmed by the structure of the last pair of legs, which are built upon the very same type as in *A. magna* Scott.

Distribution.—East of the Shetland Islands (Scott).

Page 66. Parastephos pallidus, G. O. Sars.

Distribution.—I have recently received from Th. Scott an adult male specimen and an immature female of this form, taken by him off the Scottish coast.

INDEX.

Page.

Acartia 148
bifilosa 149
Clausi 150
discaudata 152
longiremis 149
Acartiidæ 147
Acrocalanus 6
Amallophora 50
brevicornis 53, 164
magna 51
typica 51
Amphascandria 7
Anomalocera 138
Patersoni 139
Arietellidæ 123
Arietellus 124, 127
Augaptilus 117, 121
Boeckella 74
Bradyidius 31
armatus 32, 33
Bryaxis 35
brevicornis 35
Calanidæ 8
Calanoida 4
Calanopia 138
Calanus 8
Clausii 20
finmarchicus 9, 12
helgolandicus 11
hyperboreus 12
longus 112
magnus 12
parvus 17
pygmæus 17
qvinqveannulatus ... 9, 10
turbinatus 98

Page.

Calocalanus 16
Candace 133
armata 135
curta 136
bispinosa 135
elongata 134
longimana 135
norvegica 134
pectinata 135, 136
Candacia 133
armata 135
norvegica 134
Candaciidæ 132
Candacidæ 133
Chiridius 27
armatus 27, 29, 161
brevispinus 162
obtusifrons 29
Poppei 27
tenuispinus 30
Centropagidæ 73
Centropages 74
hamatus 76
typicus 75
Cetochilus 8
helgolandicus 11
septentrionalis 9
Clausia 19
elongata 20, 21
Clausocalaninæ 19
Clausocalanus 19
Corynura 73
Ctenocalanus 19
Cyclops
lacinulatus 101
longicornis 97, 98

Page.

marinus 38
Cyclopsina
borealis 107
lacinulata 100, 101
Diaixidæ 57
Diaixis 58
hibernica 59
Diaptomidæ 83
Diaptomus 84
abdominalis 115
bacillifer 88
castor 85, 87
denticornis 87
gracilis 92
graciloides 94
hamatus 87
laciniatus 91
laticeps 90
longicaudatus 97, 98
montanus 83
retusus 88
saliens 106
Westwoodi 92
Dias 148
discaudatus 152
longiremis 149
Dissceta 73
Drepanopus 19
Epischura 76
Eucalanidæ 13
Eucalanus 14
Euchæta 37
armata 27, 28
barbata 41, 163
carinata 38
glacialis 40

Page.

marina 39
norvegica 38, 40, 163
Prestandreæ 38
Euchætidæ 36
Euchætinæ 37
Eurytemora 97, 98
affinis 102
Clausii 100
gracilis 102
hirundo 102
hirundoides 102
lacinulata 100
lacustris 103
velox 100
Gaïdius 161
brevispinus 162
pungens 161
tenuispinus 162
Glaucea 84
rubens 85
Halitemora 96, 97
longicornis 97
Haloptilus 120
acutifrons 122
longicornis 121
Hemicalanus 120, 121
acutifrons 122
longicornis 121
spinifrons 122, 123
Hemipontella 141
Heterarthrandriæ 72
Heterochæta 117
compacta 118
norvegica 118
papillata 120
spinifrons 120
Heterocope 104
alpina 106
appendiculata 109
borealis 107
romana 106
robusta 106, 107
saliens 106, 107
Weissmanni 107, 108
Heterorhabdidæ 117
Heterorhabdus 117
norvegicus 118
Ichthyophorba 74
angustata 76
denticornis 75
hamata 76
Iphionyx 133

Page.

Irenæus 138
splendidus 139, 140
Isias 78
Bonnieri 79
clavipes 79
Isochæta 12
Isokerandria 56
Ivellopsis 138
Labidocera 141
Wollastoni 142
Lamellipodia 96
Leuckartiinæ 73
Limnocalanus 80
Grimaldii 81, 82
macrurus 81
sinensis 81
Lophothrix 49
Lucicutia 73
Lucicutiinæ 73
Lucullus 19
acupes 20, 21
Mecynocera 14
Metridia 110
armata 112, 113
hibernica 113
longa 112
lucens 113
Metridiidæ 110
Microcalanus 20, 155
pusillus 156
pygmæus 20
Misophria 127, 130
Misophriidæ ... 127, 129, 130
Moebianus 61
gyrans 62
Monoculus
castor 85
finmarchicus 9
Monops 138
Mormonilla 73
Osphranticum 74
Paracalanidæ 16
Paracalanus 17
aculeatus 17
hibernicus 113
parvus 17, 154
Paracartia 147
Paradiaptomus 84
Paramisophria 127
cluthæ 128
Parapontella 144
brevicornis 145

Page.

Parapontellidæ 143
Parapontellinæ 144
Parastephos 85
pallidus 65, 164
Phaënna 43, 44
spinifera 45
Phaënnidæ 42
Pleuromamma 114
robusta 115
Pleuromma 114
gracile 115
robustum 115
Poppella 73
Pontella 138, 141
Eugeniæ 139
helgolandica 142, 143
Wollastoni 142
Pontellidæ 137
Pontellina 138, 144
brevicornis 145
Pontellopsis 138
Pontia 138, 140
Patersoni 139
Pseudocalanidæ 19
Pseudocalanus 18, 24
armatus 25, 32
elongatus 20, 154
gracilis 154
major 20
pygmæus 20
Pseudocyclopia 70
caudata 70
crassicornis 70
minor 70
stephoides 71
Pseudocyclopiæ 129
Pseudocyclopiidæ 69
Pseudocyclops 130
obtusatus 131
Pseudodiaptomidæ 73
Pseudodiaptomus 73
Pseudophaënna 43
typica 44
Rhincalanus 14
cornutus 15
gigas 154
nasutus 15, 154
Scaphocalanus 50
acrocephalus 51
Scolecithricella 54
minor 55
Scolecithricidæ 49

Page.

Scolecithrix .. 49, 50, 54, 58
abyssalis 55
brevicornis 53
cristata 51
Danæ 57
dentata 55
dubia 55
hibernica 59
longifurca 55
longipes 55
marginata 55
minor 55
profunda 55
pygmæa 58
tenuiserrata 55
vittata 55
Scottia 125
Scottula 124
inæqvicornis 125
Spinocalanus 22
abyssalis 23, 157
longicornis 22

Page.

Stephidæ 60
Stephos 61
Fultoni 62
gyrans 63
lamellatus 62
minor 62
Scotti 63
Temora 96
Clausii 100, 101
finmarchica 97
inermis 102
longicornis 97
velox 100, 102
Temorella 99
affinis 102
Clausii 100
intermedia 103, 104
lacinulata 100
lacustris 103
Temoridæ 95
Temorites 96
Temoropia 96

Page.

Tharybidæ 66
Tharybis 67
macrophthalma 68
Tortanidæ 73
Tortanus 73
Typhlocalanus 64
gyrator 64
Undina 8, 9
Undinopsis 31
Bradyi 32, 163
similis 34
Xanthocalanus 45
borealis 46, 164
propinqvus 48
Ætideidæ 23
Ætideus 24
armatus 25, 159
Ælideopsis 159
rostrata 160
Ætidiinæ 24
Ætidius 24

LIST OF PLATES.

The Plates have been marked as far as possible in accordance with those belonging to the 3 previous Volumes (Amphipoda, Isopoda, Cumacea).

The following are the chief signs, with their significance:

♀ female; ♂ male; *C.* cephalosome; *R.* rostrum; *Urs.* urosome with the caudal rami; *gen. S.* genital segment of female; *O.* eye; $a.^1$ anterior antenna; $a.^2$ posterior antenna; *or. area* oral area; *L.* anterior lip; *M.* mandible; *m.* maxilla; $mp.^1$ anterior maxilliped; $mp.^2$ posterior maxilliped; $p.^1$—$p.^5$ legs of 1st to 5th pairs.

Pl. I.
Calanus finmarchicus (Gunner), female.

Pl. II.
Calanus finmarchicus; female, (continued).

Pl. III.
Calanus finmarchicus, adult male.

Pl. IV.
Calanus helgolandicus (Claus); female & male.

Pl. V.
Calanus hyperboreus, Kröyer; female & male.

Pl. VI.
Rhincalanus nasutus, Giesbrecht; female.

Pl. VII.
Rhincalanus nasutus; female (continued).

Pl. VIII.
Paracalanus parvus (Claus); female.

Pl. IX.
Paracalanus parvus; male and female (continued).

Pl. X.
Pseudocalanus elongatus, Boeck; female.

Pl. XI.
Pseudocalanus elongatus, male & female (continued).

Pl. XII.
Spinocalanus abyssalis, Giesbrecht; female. (See Suppl., p. 157.)

Pl. XIII.
Ætideus armatus, Boeck, female & male.

Pl. XIV.
Ætideus armatus; male & female (continued).

Pl. XV.
Chiridius armatus (Boeck): female & male.

Pl. XVI.
Chiridius armatus; female & male (continued).

Pl. XVII.
Chiridius obtusifrons, G. O. Sars; female & male.

Pl. XVIII.
Gaïdius tenuispinus, G. O. Sars; female. (See Suppl., p. 162.)

Pl. XIX.
Undinopsis Bradyi, G. O. Sars; female & male.

Pl. XX.
Undinopsis Bradyi; female (continued).

Pl. XXI.
Undinopsis similis, G. O. Sars; female & male.

Pl. XXII.
Bryaxis brevicornis, Boeck; female.

Pl. XXIII.
Bryaxis brevicornis; female (continued).

Pl. XXIV.
Euchæta norvegica, Boeck; female.

Pl. XXV.
Euchæta norvegica; female (continued).

Pl. XXVI.
Euchæta norvegica, Boeck; adult male.

Pl. XXVII.
Euchæta glacialis, Hansen; female & male.

Pl. XXVIII.
Euchæta barbata, Brady; female & male.

Pl. XXIX.
Pseudophaënna typica, G. O. Sars; female & male.

Pl. XXX.
Pseudophaënna typica; female (continued).

Pl. XXXI.
Xanthocalanus borealis, G. O. Sars; female & male.

Pl. XXXII.
Xanthocalanus borealis; female (continued).

Pl. XXXIII.
Xanthocalanus propinqvus, G. O. Sars: female & male.

Pl. XXXIV.
Amallophora magna, Scott; female & male.

Pl. XXXV.
Amallophora magna; female (continued).

Pl. XXXVI.
Amallophora brevicornis, G. O. Sars; female.

Pl. XXXVII.
Scolecithricella minor (Brady); female & male.

Pl. XXXVIII.
Scolecithricella minor; female (continued).

Pl. XXXIX.
Diaixis hibernica (Scott); female & male.

Pl. XL.
Diaixis hibernica; female (continued).

Pl. XLI.
Stephos lamellatus, G. O. Sars; female & male.

Pl. XLII.
Stephos lamellatus; female (continued).

Pl. XLIII.
Stephos Scotti, G. O. Sars; female & male.

Pl. XLIV.
Parastephos pallidus, G. O. Sars; male.

Pl. XLV.
Tharybis macrophthalma, G. O. Sars; female & male.

Pl. XLVI.
Tharybis macrophthalma; female (continued).

Pl. XLVII.
Pseudocyclopia stephoides, Thompson; female & male.

Pl. XLVIII.
Pseudocyclopia stephoides; female (continued).

Pl. XLIX.
Centropages typicus, Kröyer; female.

Pl. L.
Centropages typicus; female (continued).

Pl. LI.
Centropages typicus, Kröyer; adult male.

Pl. LII.
Centropages hamatus (Lilljeborg); female & male.

Pl. LIII.
Isias clavipes, Boeck; female & male.

Pl. LIV.
Isias clavipes; female (continued).

Pl. LV.
Limnocalanus macrurus, G. O. Sars: female & male.

Pl. LVI.
Limnocalanus macrurus; female (continued).

Pl. LVII.
Diaptomus castor (Jurine); female & male.

Pl. LVIII.
Diaptomus castor; female & male (continued).

Pl. LIX.
Diaptomus denticornis, Wierzejski; female & male.

Pl. LX.
Diaptomus bacillifer, Koelbel; female & male.

Pl. LXI.
Diaptomus laticeps, G. O. Sars; female & male.

Pl. LXII.
Diaptomus laciniatus, Lilljeborg; female & male.

Pl. LXIII.
Diaptomus gracilis, G. O. Sars; female & male.

Pl. LXIV.
Diaptomus graciloides, Lilljeborg; female & male.

Pl. LXV.
Temora longicornis (Müller); female & male.

Pl. LXVI.
Temora longicornis; female (continued).

Pl. LXVII.
Eurytemora velox (Lilljeborg); female & male.

Pl. LXVIII.
Eurytemora velox; female (continued).

Pl. LXIX.
Eurytemora hirundoides (Nordqvist); female & male.

Pl. LXX.
Eurytemora lacustris, Poppe; female & male.

Pl. LXXI.
Heterocope saliens (Lilljeborg); female & male.

Pl. LXXII.
Heterocope saliens; female (continued).

Pl. LXXIII.
Heterocope borealis (Fischer); female & male.

Pl. LXXIV.
Heterocope appendiculata, G. O. Sars; female & male.

Pl. LXXV.
Metridia longa (Lubbock); female & male.

Pl. LXXVI.
Metridia longa; female (continued).

Pl. KXXVII.
Metridia lucens, Boeck; female & male.

Pl. LXXVIII.
Pleuromamma robusta (Dahl); female & male.

Pl. LXXIX.
Pleuromamma robusta; female (continued).

Pl. LXXX.
Heterorhabdus norvegicus (Boeck); female & male.

Pl. LXXXI.
Heterorhabdus norvegicus; female (contin.)

Pl. LXXXII.
Haloptilus longicornis (Claus); female.

Pl. LXXXIII.
1. Haloptilus longicornis; female (continued).
2. Haloptilus acutifrons, Giesbrecht; female.

Pl. LXXXIV.
Scottula inæqvicornis, G. O. Sars; female.

Pl. LXXXV.
Scottula inæqvicornis; male & female (continued).

Pl. LXXXVI.
Paramisophria cluthæ, Scott; female & male.

Pl. LXXXVII.
Paramisophria cluthæ; female (continued).

Pl. LXXXVIII.
Pseudocyclops obtusatus, Brady; female & male.

Pl. LXXXIX.
Candacia norvegica (Boeck); female.

Pl. XC.
Candacia norvegica; male & female (contin.)

Pl. XCI.
Candacia armata (Boeck); female & male.

Pl. XCII.
Anomalocera Patersoni, Templt.; female.

Pl. XCIII.
Anomalocera Patersoni; female (continued).

Pl. XCIV.
Anomalocera Patersoni, Templt.; adult male.

Pl. XCV.
Labidocera Wollastoni (Lubbock); female & male.

Pl. XCVI.
Labidocera Wollastoni; female & male (continued).

Pl. XCVII.

Parapontella brevicornis (Lubbock); female & male.

Pl. XCVIII.

Parapontella brevicornis; female & male (continued).

Pl. XCIX.

Acartia longiremis (Lilljeborg); female.

Pl. C.

Acartia longiremis; male & female (continued).

Pl. CI.

Acartia Clausi, Giesbrecht; female & male.

Pl. CII.

Acartia discaudata, Giesbrecht; female & male.

Suppl. Pl. I.

Pseudocalanus gracilis, G. O. Sars; female & male.

Suppl. Pl. II.

Microcalanus pusillus, G. O. Sars; female.

Suppl. Pl. III.

1. Microcalanus pusillus; male.
2. Spinocalanus abyssalis, Giesbrecht; adult male.

Suppl. Pl. IV.

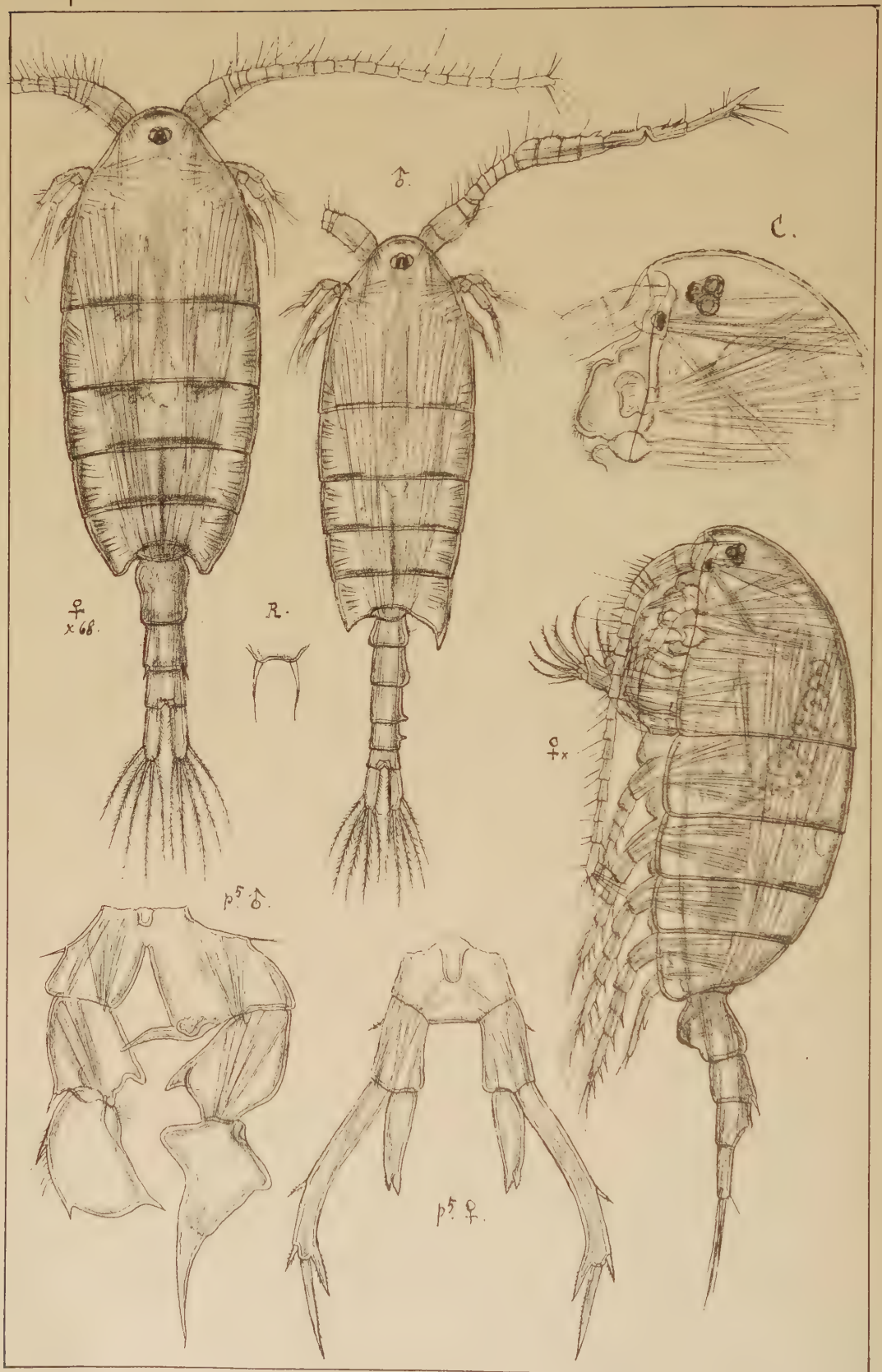
Ætideopsis rostrata, G. O. Sars; female.

Suppl. Pl. V.

Ætideopsis rostrata; female (continued).

Suppl. Pl. VI.

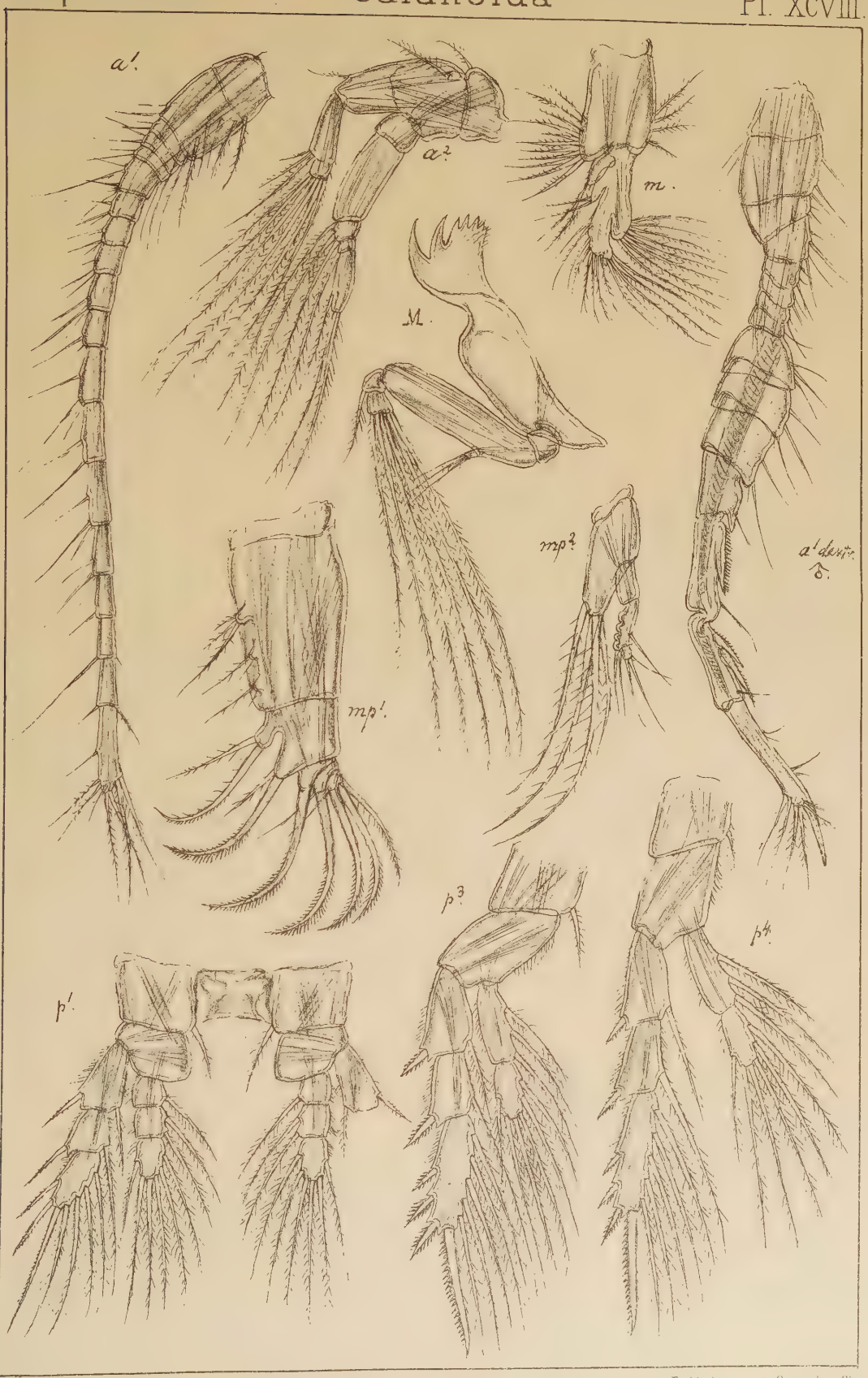
1. Gaïdius tenuispinus, G. O. Sars; adult male.
1. Gaïdius brevispinus, G. O. Sars; female.



G.O. Sars autogr

Trykt i den private Opmaaling. Chra

Parapontella brevicornis (Lubbock)



G.O Sars autogr

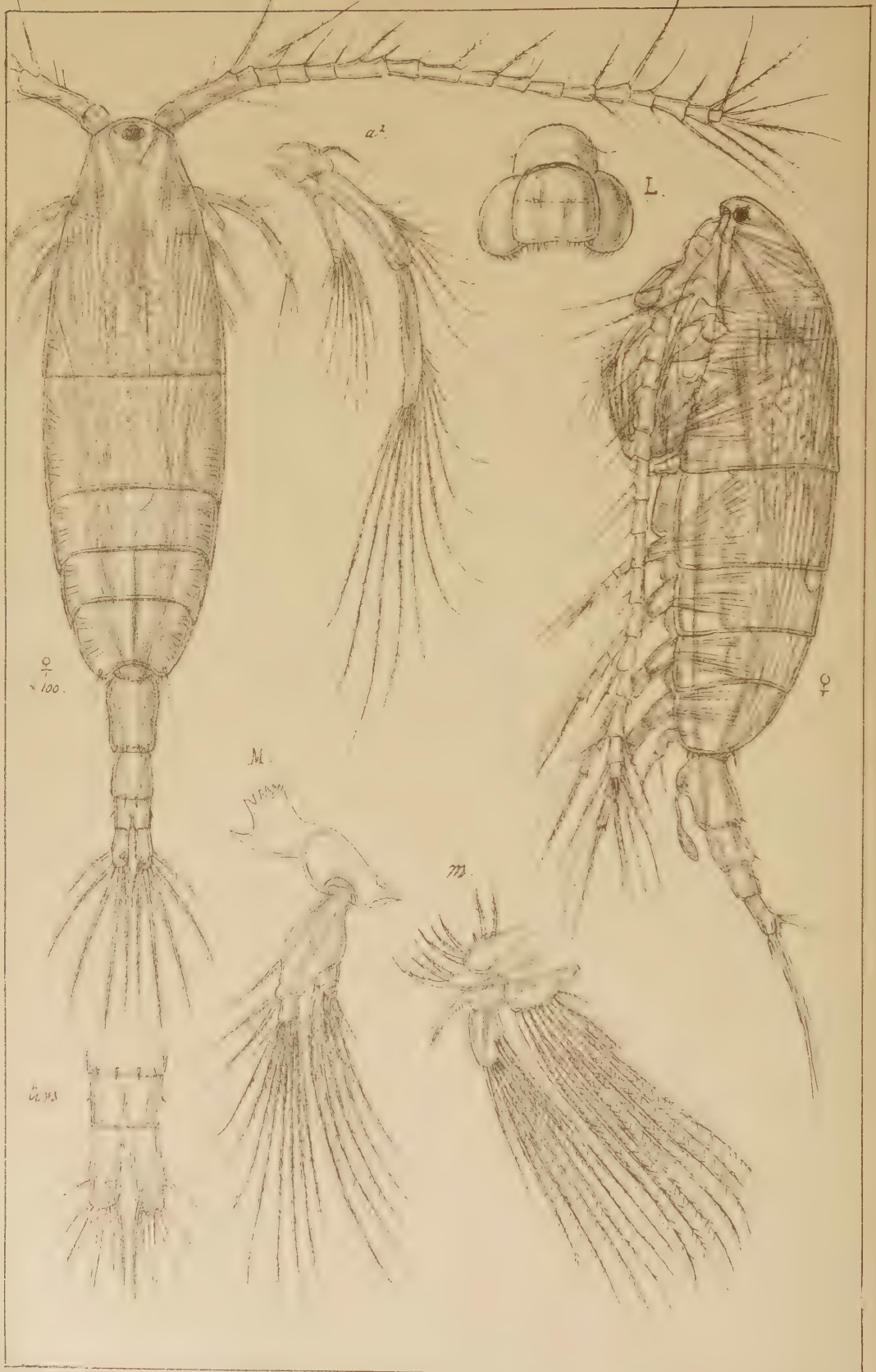
Trykt i den private Opmaaling. Chra

Parapontella brevicornis (Lubbock)
(continued)

Copepoda

Calanoida

Acartiidæ. PI. XCIX



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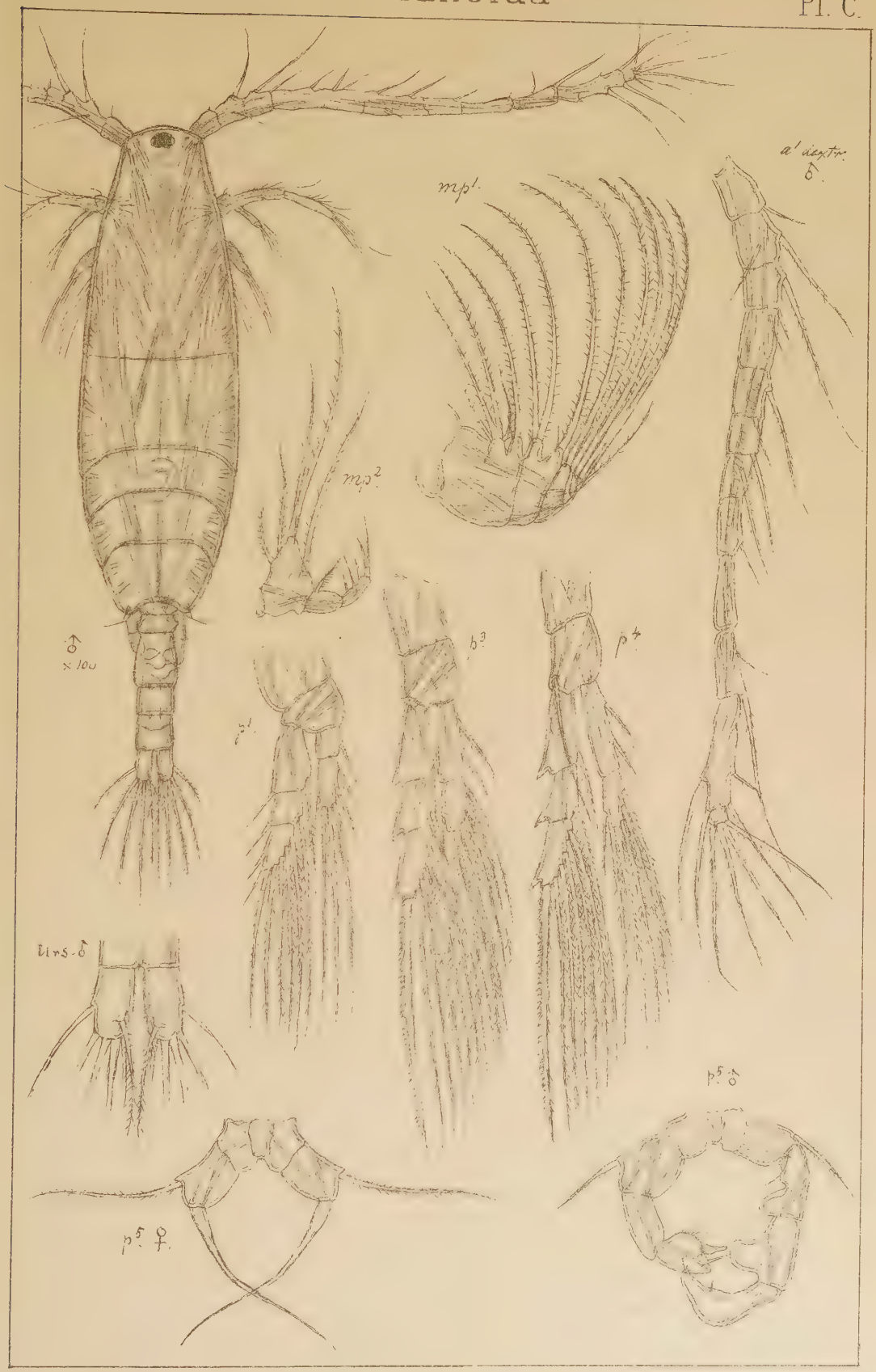
Trykt i den private Opmaaling. Chra

Acartia longiremis (Lilljeborg)

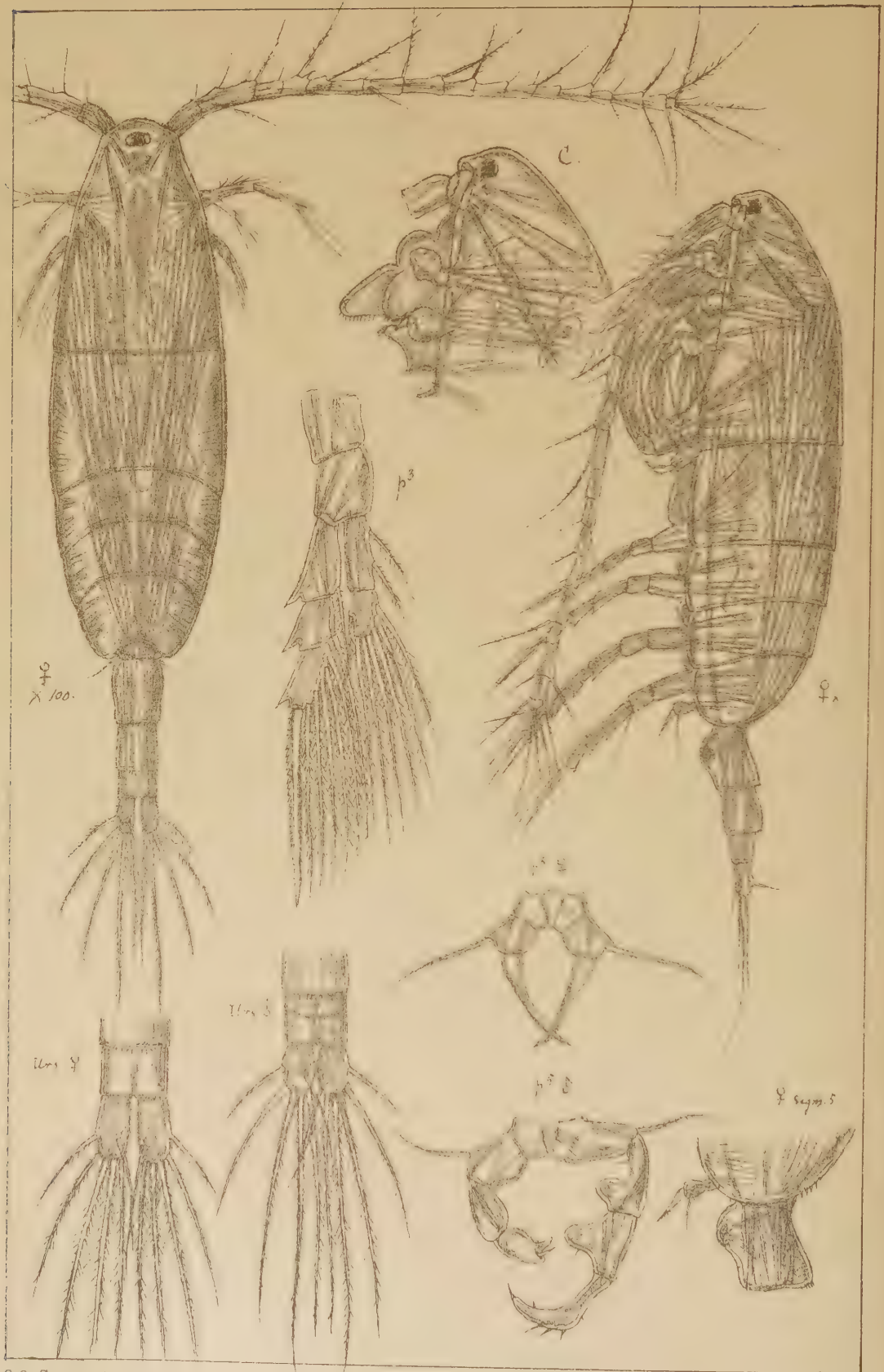
Copepoda
Calanoida



G. O. Sars autogr.

Trykt den private Opmaaling Chra

Acartia longiremis (Lilljeborg)
(continued)

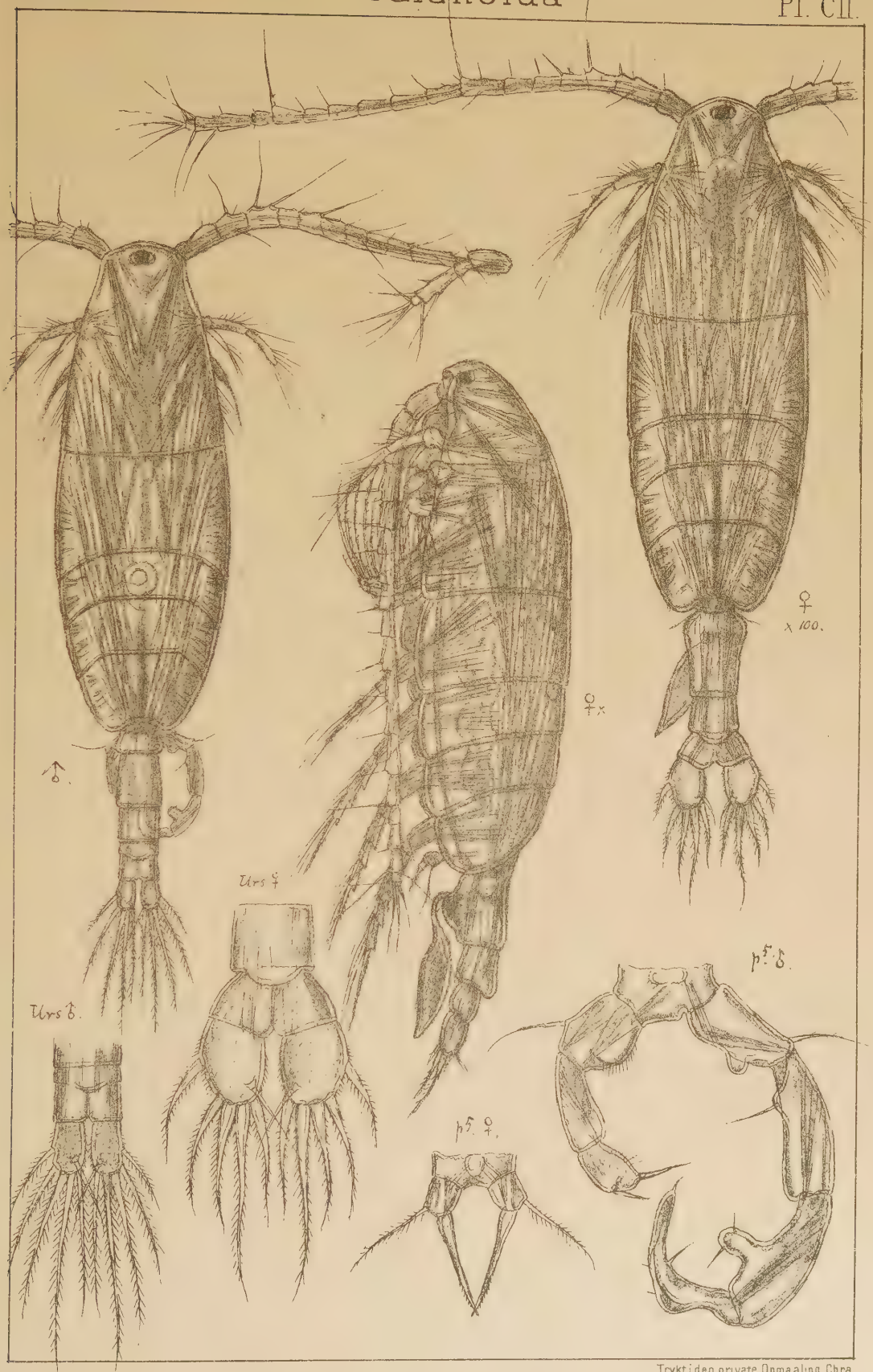


G O. Sars autogr

Trykt i den private Opmaaling, Chra

Acartia Clausi, Giesbrecht.

Copepoda
Calanoida



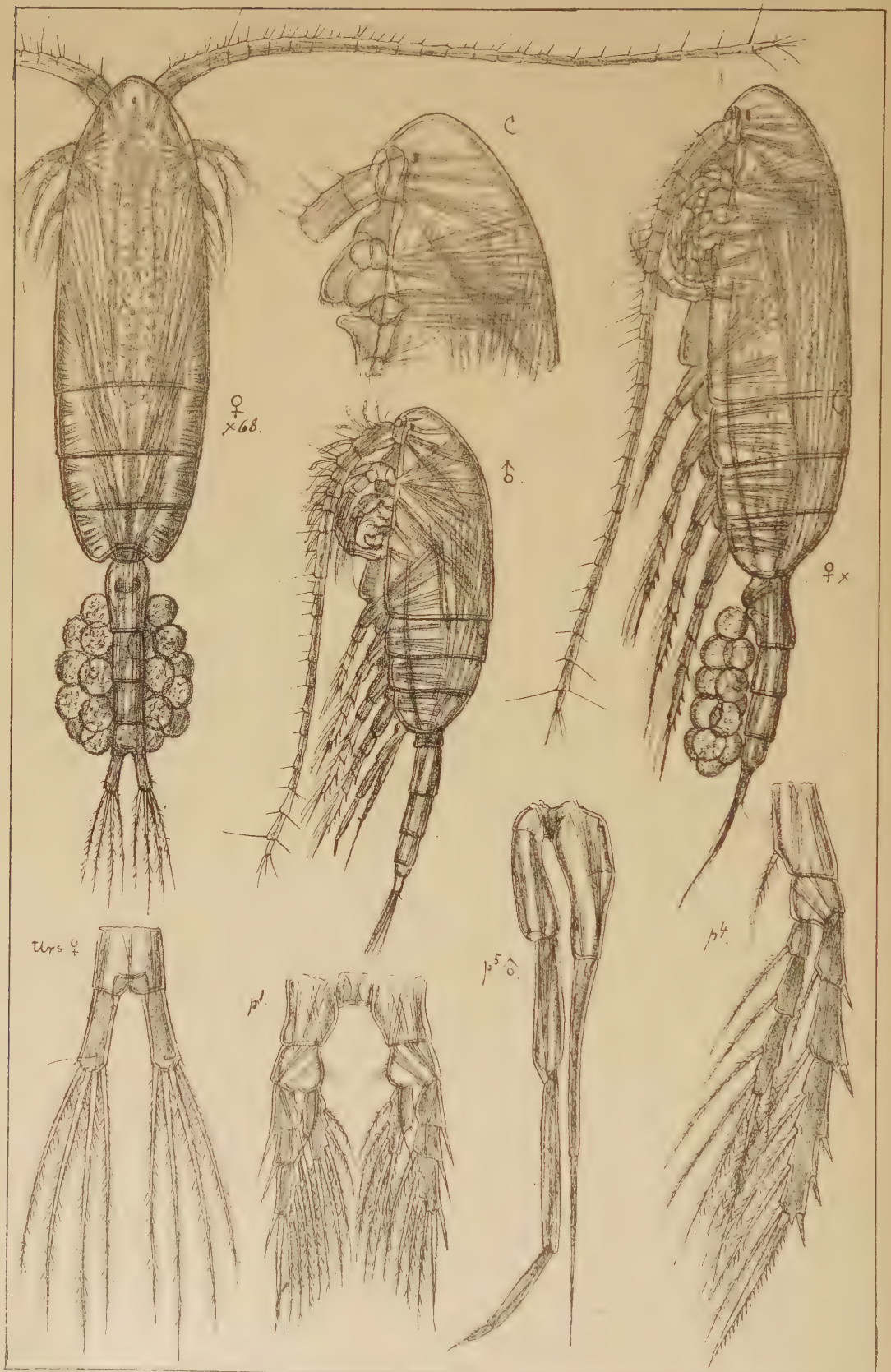
G.O Sars autogr.

Tryktiden private Opmaaling. Chra

Acartia discaudata Giesbrecht.

Copepoda

Pseudocalanidæ. Calanoida Suppl. PI. I



Pseudocalanus gracilis, G.O. Sars.

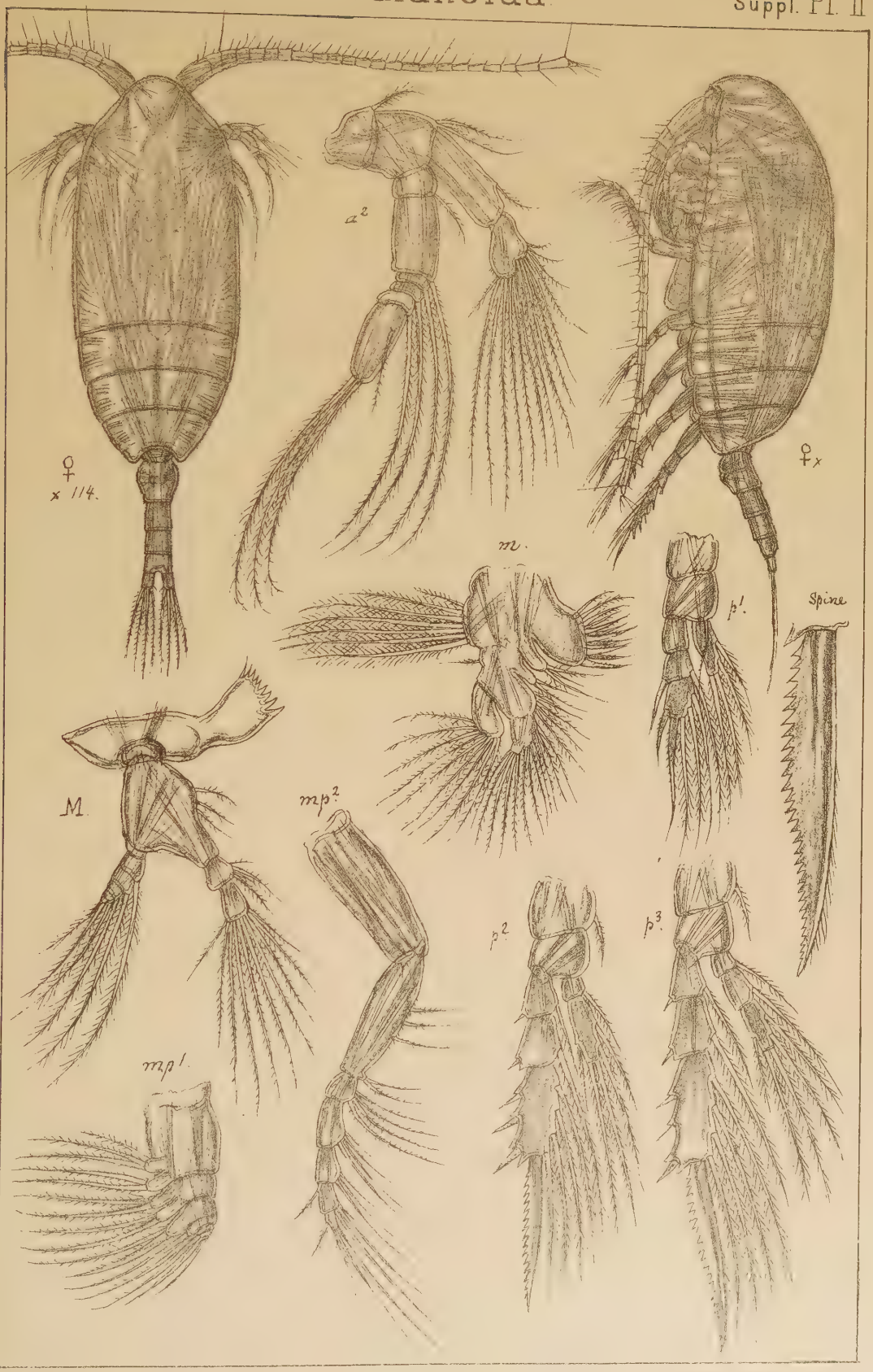
Trykt i den private Opmaaling, Chra

Copepoda

Calanoida

Pseudocalanidæ.

Suppl. PI. II



G. O. Sars autogr.

Microcalanus pusillus, G. O. Sars.

Copepoda

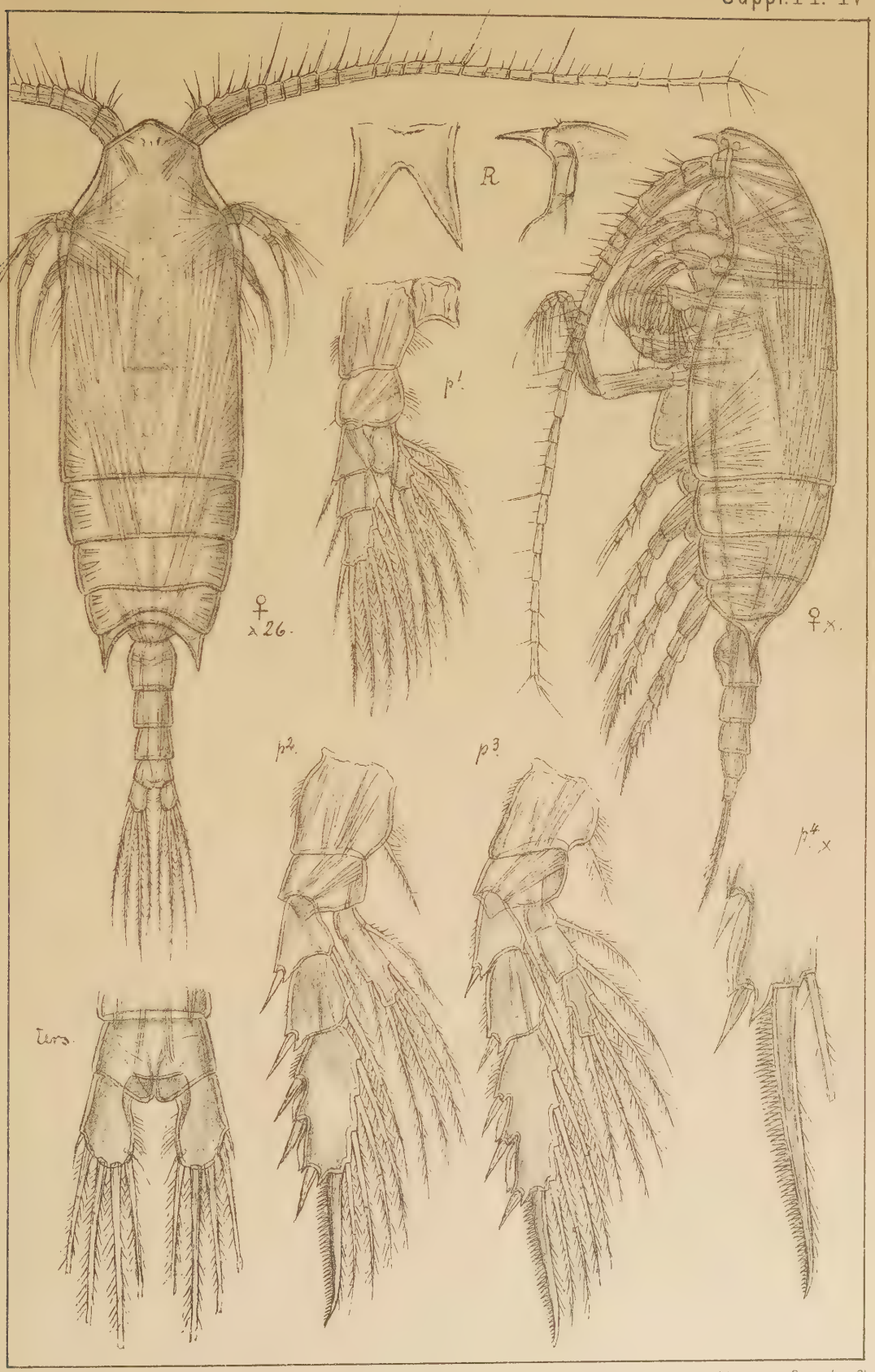
Pseudocalanidæ. Calanoida Suppl. PI. III.

G.O. Sars autogr

1. Microcalanus pusillús, G.O. Sars. (continued)
2. Spinocalanus abyssalis, Giesbrecht (male)

Trykt i den private Opmaaling, Chra

Copepoda
Calanoida



G O Sars autogr

Trykt i den private Opmaaling, Chra

Ætideopsis rostrata, G. O. Sars.

G O Sars autogr

Trykt i den private Opmaaling, Chra

Ætideopsis rostrata, G.O.Sars.
(continued)

Copepoda
Calanoida

G O Sars autogr

Trykt i den private Opmaaling Chra

1. Gaidius tenuispinus, G.O.Sars.
(male)
2. Gaidius brevispinus, G.O.Sars.